

11.—*Contributions to the Crustacean Fauna of South Africa.*

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NO. 11. TERRESTRIAL ISOPODA.

(With 80 Text-figures.)

THE following account of the South African Woodlice cannot by any means claim to be exhaustive. Although quite a large collection has been accumulated by the South African Museum, the areas in which collecting has been done are exceedingly small in comparison with the total area under consideration. An enormous amount of work, both in the field and in the laboratory, remains to be done before a monograph of the woodlice can be attempted. This preliminary study, however, may prove useful to future students.

Historically there is but little to say about the woodlouse fauna of South Africa. The first 6 species were described in 1833 by Brandt. Guérin described 1 in 1836, and Krauss 2 in 1843. No further species were recorded during the next forty years, until Budde-Lund published his *Crustacea Isopoda Terrestria* in 1885. Even then only 6 more species were added, some of which had been collected by the botanist J. F. Drege in the course of his travels in the Cape and Natal in the early years of the nineteenth century.*

A gap of ten years followed, until in 1893 the arachnologist Simon travelled in South Africa and collected some woodlice which were described by Dollfus (1895). Seven species were added to the fauna list. Purcell described the curious termitophilous *Phylloniscus* in 1903. In 1904 Budde-Lund revised the genus "Armadillo" and recorded 4 species. The German South Polar Expedition added another species (Budde-Lund, 1906); and Schultze's expedition collected 15 more species (Budde-Lund, 1909).

* See Meyer, E. H. F., Comment. Plant. Afr. Austr. collegit J. F. Drege, Leipsic, 1835. It is interesting to note that Mr. J. L. Drege, who supplied Entomostraca to G. O. Sars through Dr. Purcell, also contributed to this Museum, round about the year 1897, some of the woodlouse material utilised in this paper. I have not been able to discover whether Mr. J. L. Drege was a descendant or relative of the earlier naturalist.

Thus in 1910 Stebbing was able to list 32 (plus 2 introduced) species in his General Catalogue of South African Crustacea. By accident, however, he omitted 6 of Dollfus's species and all the "Armadillos" of Budde-Lund's 1904 revision. On the other hand he admitted 4 species from the Congo,* a region considerably removed from South Africa, even with the wide limits set to it for purposes of this work, viz. as far north as 15° S. lat. (Mossamedes—Mozambique). Stebbing therefore should have listed 43 truly South African species, plus 2 introduced.

In the last two decades 28 species have been added, though some of these are in my opinion synonyms. Including the new species and records in this work, the fauna list at present comprises 139 species, plus 6 introduced species.

This large increase in the fauna list is due to the energy of the past and present members of the staff of the South African Museum, beginning with the late Dr. Purcell and Mr. Lightfoot. In the lists of localities under each species the collectors are acknowledged by their respective initials, thus: Dr. Purcell (W. F. P.), Mr. Lightfoot (R. M. L.), Dr. Haughton (S. H. H.), Mr. Tucker (R. W. E. T.), Mr. Drury (J. D.), Dr. Lawrence (R. F. L.), Dr. Hesse (A. J. H.), Dr. Gill (E. L. G.), Dr. Boonstra (L. D. B.), Mr. Thorne (C. W. T.). The names of authors responsible for already published localities are quoted in full.

The localities in South West Africa, including Ovamboland and the Kaokoveld, will be found in the map accompanying Connolly's report on the Non-marine Mollusca of that region (*Ann. S. Afr. Mus.*, vol. xxix. pt. 2, 1931).

In the following descriptions the colours of the living animals are given whenever I have personally observed them, or the specimens when received at the Museum have been preserved for so short a time as to preclude any great changes. In nearly all cases a prolonged immersion in alcohol causes the usual slaty or greyish colour to fade, at first to a grey and yellowish mottling, and eventually to a uniform pale yellowish. The colours given by Budde-Lund therefore are often misleading. In the colour notes, the word antennae always refers to the second antennae.

Teratology.—Regrettable as it is, attention must be drawn to

* Viz. *Ligia gracilipes* B-L., *Niambia squamata* B-L., *Diploexochus (Polyacanthus) aculeatus* B-L., and *Eubelum lubricum* B-L. By "South Africa" Budde-Lund (1885) evidently understood Africa south of the equator. The mistake has been followed by Jackson (1922) and Panning (1924).

the illustrations in Collinge's 1919 and 1920 papers. Of the 17 figures of the whole animal in these papers, 7 are abnormal as regards the number of peraeon segments, and 1 also as regards the number of pleon segments; two of them show 8 peraeon segments, four only 6 segments, and one shows only 5 segments; fig. 1 on pl. 14 (1919) also shows 4 pleon segments with expanded pleurae instead of only 3. It is incredible that so many abnormal specimens should have been included in the comparatively small collection submitted to this author. I have never met with any variation in the number of peraeon segments, and I have found only a single reference to such an abnormality (Goto, Annot. Zool. Jap., v, 1906, pl. 279, fig. 8; *Ligia* with 8 peraeon segments). The errors in the figures in question must therefore be ascribed to the artist (though Collinge himself mentions 8 "mesosomatic" segments in *Akermania*, 1919, p. 231); but if mistakes in such a major feature as the number of segments can occur, one's confidence in the accuracy of the details is considerably shaken.

Introduced Species.—In Stebbing's 1910 Catalogue only 2 such species were listed: *Porcellio scaber* and *Porcellionides pruinosus*, Dollfus's record (1895) of *Philoscia elongata* from Cape Town being omitted. The first species was recorded by Budde-Lund (1885) from Cape Town; the second by Dollfus (1895) from Cape Town, Hebron, and Hamman's Kraal. In 1920 Collinge recorded *Philoscia muscorum*, and also *P. pruinosus*, from Natal.

I am now able to report the presence in Cape Town of 2 more species: *Porcellio laevis* and *Armadillidium vulgare*, making a total of 6 introduced species. It is rather surprising that *P. laevis* and *A. vulgare* have not been previously reported, unless they are indeed quite recent importations.

P. pruinosus is the most widely spread species, and it may possibly be of interest to give some of the dates when it was collected, though of course this is no guide as to the date of its actual first appearance in these localities. Hebron and Hamman's Kraal 1893 (coll. Simon), Johannesburg 1898, Clanwilliam 1898, 3 localities in South West Africa 1911 (see Panning 1924), Durban 1912 (K. H. B.), Pietermaritzburg 1915, Zak River 1916, Salisbury 1917, Zululand 1918, Bulawayo 1924, Masiene (Portuguese East Africa) 1924.

Termitophilous and Myrmecophilous Species.—Budde-Lund (1909, p. 66) draws attention to the fact that termitophilous forms belong to the "Ligiids" [*Ligiidae* + *Trichoniscidae*], which like the Termites are an ancient group; whereas the Oniscid forms, e.g. *Platyarthrus*,

Leptotrichus, are found in ants' nests, both Oniscids and ants being of much later evolution.

In South Africa the only truly termitophilous genera, *i.e.* those found only in Termite nests, are *Phylloniscus*, *Schöblia*, *Titana*, and *Kogmania*, all of which belong to the *Trichoniscidae*. It is probable that more of these interesting forms await discovery.

There are no truly myrmecophilous genera or even species apparently. Several species, *e.g.* *Diploexochus saldanhae*, *pauperculus*, *conisaleus*, have been found in ants' nests under stones, but they may also occur under stones where there are no ants.

Mountain Fauna.—In the course of researches on the fauna of the mountain ranges of the Cape Province, special attention has been paid to the woodlice, with the result that a goodly number of new forms has been discovered. Nevertheless it is certain that many more will be found by further and more intensive collecting.

For the most part the woodlice of the mountain fauna belong to the Armadillidiids (*Diploexochus*). Among the Oniscids the genus *Gerufa* inhabits the upper levels in contradistinction to the allied genus *Niambia* which is characteristic of the plains and lower levels. The most interesting discovery, however, is the presence of several species of primitive Trichoniscids belonging to the genera *Trichoniscus* and *Paranotoniscus*, one of the former being a large cavernicolous form.

So far as can be seen from our present knowledge, the effects of isolation are well marked, and the main mountain ranges and massifs are characterised by their own series of species. But much work remains to be done in tracing out the areas of distribution of species which are hitherto known only from a single locality.

Acknowledgments.—As in the case of my other Crustacean works I am under deep obligations to Dr. Calman of the British Museum. In 1920 Dr. Calman very kindly permitted me to examine the Budde-Lund collection of Terrestrial Isopods and Budde-Lund's MSS. notes, which are preserved in the British Museum. The Budde-Lund MSS. contain several unpublished figures. One of these is here reproduced, and five figures have been drawn from specimens in the Budde-Lund collection.

My thanks are also tendered to Dr. Warren, Director of the Natal Museum, and to Mr. Hewitt, Director of the Albany Museum, for sending me material for examination.

To the Royal Society of South Africa and the Research Grant Board I am indebted for grants-in-aid, which have enabled me to investigate specially the mountain fauna.

The Zoological Survey of Ovamboland and the Kaokoveld, which was carried out by the South African Museum, and produced several interesting species, was sponsored by the Administration of South West Africa.

Key to the families.

(Adapted from Chilton, 1901.)

- I. Mandibles with well-developed molar. Inner lobe of 1st maxilla with 3 plumose setae.
 - A. Uropoda elongate, exposed. 1st antenna 3-jointed, mobile.
 - 1. Flagellum of 2nd antenna many jointed. Two penes *Ligiidae*.
 - 2. Flagellum of 2nd antenna usually not more than 6-jointed. A single penis *Trichoniscidae*.
 - B. Uropoda opercular, concealed under telson. 1st antenna single jointed, immobile *Tylidae*.
- II. Mandibles without molar, its place taken by a brush-like seta or tuft of setae.
 - A. Inner lobe of maxilla 1 with 2 plumose setae.
 - 1. Maxilliped with palp large, well developed, the inner plate acute *Detonidae*.
 - 2. Maxilliped with palp small, feeble, the inner plate truncate.
 - a. Uropoda produced, reaching beyond telson, which is usually narrow and conically produced. Usually unable to roll up into a complete ball *Oniscidae*.
 - b. Uropoda short, not reaching beyond telson, which is usually short and broad. Usually able to roll up into a complete ball *Armadillidiidae*.
 - B. Inner lobe of maxilla 1 with 5-15 plumose setae *Eubelidae*.

The only family which is omitted is *Helleriidae*, which does not occur in Africa (see under *Tylidae*).

FAM. LIGIIDAE.

- 1885. *Ligiæ* (part). Budde-Lund, Crust. Isop. Terr., p. 242.
- 1898. *Ligiidae*. Sars, Crust. Norw., ii, p. 155.
- 1907/8. ,, (part). Racovitza, Arch. Zool. exp. gen., ser. 4, vol. vii, p. 145, and ix, p. 244.
- 1922. ,, Wahrberg, Ark. Zool., xv, 1, p. 67.
- 1928. ,, Verhoeff, Zool. Anz., lxxvi, pp. 25-36 and 113-123.

Eyes large. First antenna 3-jointed. Second antenna with multi-articulate flagellum. Mandible with molar, which, however, carries no seta or penicil. Maxilla 1, inner lobe with 3 plumose setae. Maxilliped 7-jointed, *i.e.* with 5-jointed palp arising from the

moderately large 2nd joint. Five pairs of double branched pleopods ; outer (opercular) branches (lobes or rami) without air-cavities. The inner branch of 1st pleopod not modified as a copulatory organ. Uropods not opercular, wholly exposed. Vasa deferentia opening separately at apices of two penes. Five pairs of brood lamellae on peraeon segments 1-5 ; no cotyledons (*cf.* fig. 13, p. 226).

The family is here regarded in the same restricted sense as in Sars' work, namely, excluding the Trichoniscids. It is the most primitive family of woodlice.

Gen. LIGIA Fabr.

1795. *Ligia*. Weber, Nomencl. Ent., p. 92.
 1798. „ Fabricius, Suppl. Ent. Syst., p. 301.
 1814. *Ligyda*. Rafinesque, Anal. Nat., p. 101.
 1885. *Ligia*. Budde-Lund, Crust. Isop. Terr., p. 258.
 1893. „ Dollfus, Feuille J. Natur., 3rd ser., 24 année (geogr. distribution).
 1898. „ Sars, Crust. Norw., ii, p. 155.
 1899. „ Chilton, Ann. Mag. Nat. Hist. (7), iii, p. 197 (sexual characters).
 1901. „ *Id.*, Trans. Linn. Soc. Lond., viii, p. 106.
 1905. *Ligyda*. Richardson, Bull. U.S. Nat. Mus., No. 54, p. 673.
 1907. *Ligia*. Hewitt, L.M.B.C. Memoirs, No. 14.
 1916. „ Chilton, Mem. Ind. Mus., v, p. 462.
 1917. „ Tait, Proc. Roy. Soc. Edin., xxxvii, pp. 50-94 (immersion experiments, moulting, limb-taxis).
 1918. „ Hansen, Dan. Ingolf Exp. III, v, p. 201 (peduncle of 2nd antenna).
 1920. *Ligyda*. van Name, Bull. Amer. Mus. Nat. Hist., xliii, p. 72.
 1920. *Ligia*. Collinge, Ann. Nat. Mus., iv, p. 472.
 1922. „ Jackson, Proc. Zool. Soc. Lond., ii, p. 683 (revision and bibliography).
 1922. „ Wahrberg, Ark. Zool., xv, 1, pp. 12, 30, 36, 42, 47, 52.
 1924. „ Panning, Beitr. Kennt. Land. Süßwasserf. S.W. Afr., ii, p. 195 (mouth-parts).
 1924. „ Barnard, Trans. Roy. Soc. S. Afr., xii, p. 29 (gut).
 1925. „ Tait, Scot. Nat. Edin., p. 13 (adaptations to shore life).

1926. *Ligia*. Jackson, Proc. Zool. Soc. Lond., ii, p. 885 (morphology of head).
1927. „ *Id.*, Ann. Mag. Nat. Hist. (9), xix, p. 129.
1928. „ *Id.*, Proc. Zool. Soc. Lond., i, p. 569 (morphology of head).
1928. „ Verhoeff, Zool. Anz., lxxvi, p. 115.
1929. „ Arcangeli, Ann. Mus. Zool. Napoli, v, p. 15 (brood-pouch).
1931. „ Nicholls, J. Mar. Biol. Assoc., n.s., xvii, p. 655 (habitat, feeding, gut, etc.).

Telson with postero-lateral angles developed, though often small or only slightly produced. Peduncle of uropod not produced on inner distal angle, rami arising close together, subequal in length.

We owe to Jackson (1922) a valuable revision of this genus, based on an examination of the British Museum material, which includes Budde-Lund's collection. I have also examined this material, but not in the thorough and detailed manner that Jackson has done. In fact I only examined two characters, the penis (more accurately penes) and the 2nd pleopod.

The first of these characters is ignored by Jackson, and of the pleopods he says (p. 687): "I have not found the pleopods to be of any systematic value." On the contrary I find most excellent specific characters in the copulatory stylet on the 2nd pleopod, as well as in the penis.

The penis has been figured by Sars (1898, pl. lxx), Chilton (1899, pl. viii), and Hewitt (1907, pl. iv, fig. 4) for *oceanica*; by Chilton (1901, pl. ii) for *novae-zealandiae*; and by Chilton (1916, fig. 15) for *exotica*. Chilton in both 1901 and 1916 refers to it in connection with the 1st pleopod, and says (1901, p. 113) it "no doubt springs from the last segment of the mesosome but is adherent to the protopodite of the pleopod and in dissection always comes away with it." He also states that it is grooved throughout its length and together with the endopodite (stylet) of the 2nd pleopod forms a tube for the passage of the semen.

The penis does arise from the posterior margin of the 7th peraeon segment, in fact right from the very edge, but in my experience is not adherent to the 1st pleopod, and does not come away with the latter in dissection. Nor do I find that it is grooved. In some species it lies in a groove of the stylet on pleopod 2. These two appendages thus give mutual support, rendering the combined appendage more rigid for purposes of intromission. There would seem to be no object

in the penis being grooved and forming a tube with the stylet, as the orifices of the vasa deferentia are situated at the apex of the penis (Hewitt's 1907 figure is correct, though in the text he says "base"). (Cf. also Arcangeli, 1927, *Ricerca di Morph. e Biolog. Anim.*, ii, No. 2.)

From a taxonomic point of view the penes of *oceanica* and *nozae-zealandiae* are quite distinct. I give figures here of four other types to confirm the specific value of this character. In the South Australian species (which is quite distinct from *nozae-zealandiae* as shown by the

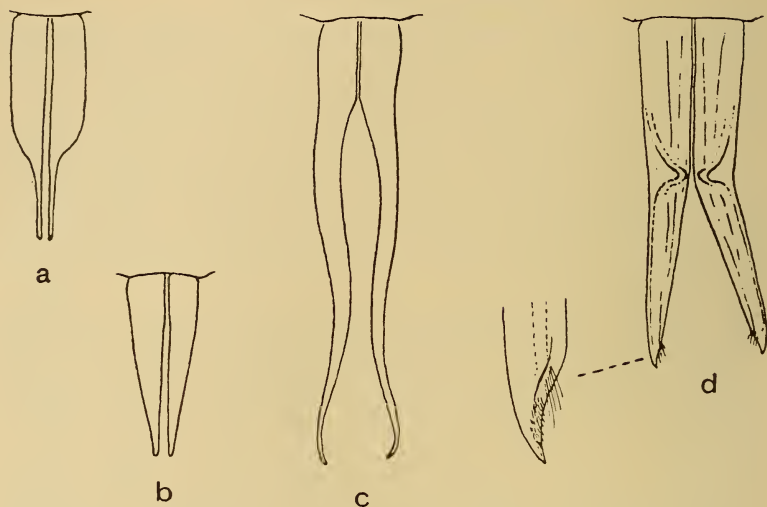


FIG. 1.—*Ligia*. Penes of: *a*, "flicornis" B-L. (MSS.) from Colon (specimen in British Museum); *b*, *exotica*; *c*, a South Australian species; *d*, *dilatata*, *glabrata*, and *natalensis*.

stylet on 2nd pleopod) it is very long (fig. 1, *c*), reaching almost to the end of the telson, as also does the stylet on 2nd pleopod. In the specimen in the British Museum, *ex coll.* Budde-Lund, bearing Budde-Lund's MS. name "flicornis," from Colon, the distal portion is abruptly narrower than the basal portion (fig. 1, *a*). In three South African species (fig. 1, *d*) the penis is triquetral in section, and the flat inner surface can be closely adpressed to that of its fellow; the distal portion can be splayed outwards by means of a "pseudo-articulation," a thinning of the chitin.

As regards the stylet on the 2nd pleopod, the figures of Sars, Hewitt, and Chilton indicate that this appendage also is a character of taxonomic importance. The South African species, here figured (fig. 2),

are quite distinct, and for further confirmation future students may be referred to the British Museum collection, where they will find that *pallasii*, *olfersi*, *cinerascens*, "flicornis," for example, show specific differences. Jackson has united *dentipes* B-L. with *exotica*, but the stylet is quite different. New Zealand and South American material of *novae-zealandiae* should be carefully compared, as it may be possible to uphold Dana's *cursor* (cf. Chilton, 1924, N.Z. Journ. Sci. Techn., vi, p. 287).

Panning (1924) has given some interesting details of certain differences in the mouth-parts, and on this basis has suggested a very

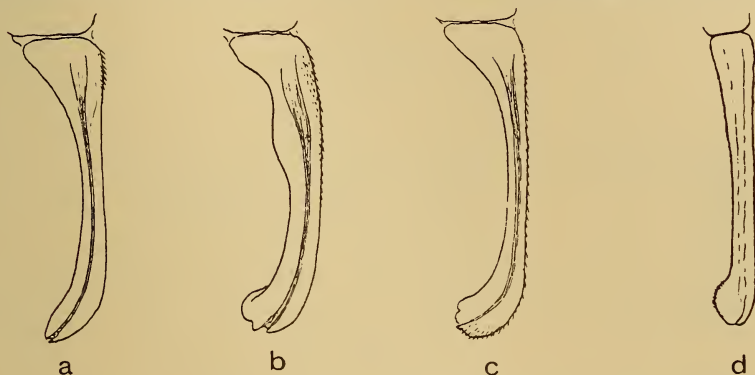


FIG. 2.—*Ligia*. Stylet on pleopod 2 ♂ of : a, *dilatata* ; b, *glabrata* ; c, *natalensis* ; d, *exotica*.

close relationship between the South African species, *dilatata*, *glabrata*, and *natalensis*, and the New Zealand species *novae-zealandiae*. To his observations can be added the fact that the inner plate of the maxilliped of *dilatata* and *natalensis* conform to the type figured by him for *glabrata*, i.e. the apex is rounded and there are 2-3 short conical spines subterminally on the inner margin, proximal to which the margin is setulose.

Four species are known from Africa south of lat. 15° S., but *gracilipes* from Portuguese Congo (Kabinda, 5° S.), as stated in the introduction, is not included.

The first three species are closely allied as regards the penis, peraeopods 1-3 in ♂, outer ramus of 1st pleopod ♂, the ear-like lobes external to bases of 2nd antennae, the telson, and the mouth-parts.

Key to the South African species.

- A. Telson evenly convex between the postero-lateral points.
1. Body in adult ♂ broadly oval. ♂ stylet on pleopod 2 apically pointed.
 - a. Peduncle of antenna 2 fairly stout, reaching end of peraeon segment 2, flagellar joints stout *dilatata*.
 - b. Peduncle of antenna 2 slender, reaching end of segment 3, flagellar joints slender *dilatata* var. *gracilior*.
 2. Body in both sexes elongate oval. ♂ stylet on pleopod 2 apically spatulate.
 - a. Antenna 2 reaching end of peraeon *glabrata*.
 - b. Antenna 2 reaching end of pleon *natalensis*.
- B. Telson with a median point *exotica*.

Ligia dilatata Brdt.(Figs. 1, *d* ; 2, *a* ; 3, *a*.)

1833. *Ligia dilatata*. Brandt, Consp. Oniscid, p. 172 (10).
 1843. " " Krauss, Südafrik. Crust., p. 62.
 1885. " " Budde-Lund, Crust. Isop. Terr., p. 262.
 1909. " " *Id.*, in Schultze, Reise, ii, p. 64.
 1910. " " Stebbing, Gen. Cat. S. Afr. Crust., p. 437.
 1920. " " Collinge, Ann. Nat. Mus., iv, p. 475, pl. xxviii, figs. 19-27.
 1922. " " Jackson, Proc. Zool. Soc., p. 701.
 1924. " " Barnard, Ann. S. Afr. Mus., xx, p. 236.

Body broadly oval in adult ♂, narrower in ♀ and young, dorsal surface minutely granulate. Antennary tubercles (*i.e.* the ear-like lobes external to the bases of 2nd antennae) more rounded, and their ventral surface less convex, than in *oceanica*. Epimera, except on 1st segment, distinctly separated from tergites by grooves, which, however, are indistinct in young. Pleon considerably narrower than peraeon. Telson with distal margin evenly convex, postero-lateral angles very slightly produced.

Antenna 2 reaching to end of 4th peraeon segment (measured round the margins of segments), peduncle not beyond end of 2nd segment, flagellum 15-18 jointed, joints not twice as long as broad, shortly setose. Mouth-parts as in *glabrata*.

Peraeopods 1-3, 5th joint ovately expanded in ♂, oblong in ♀; 6th joint of peraeopod 7 scarcely 6 times as long as broad.

Penis as figured, apex minutely setulose.

Pleopod 1 in ♂, outer ramus with inner distal angle rounded (not pointed as in *oceanica*). Stylet on pleopod 2 in ♂ apically curved

outwards, acute, the seminal groove opening at apex, inner margin setulose only at base.

Uropods not quite half length of body, rami half as long again as peduncle, which is cylindrical, outer margin not keeled.

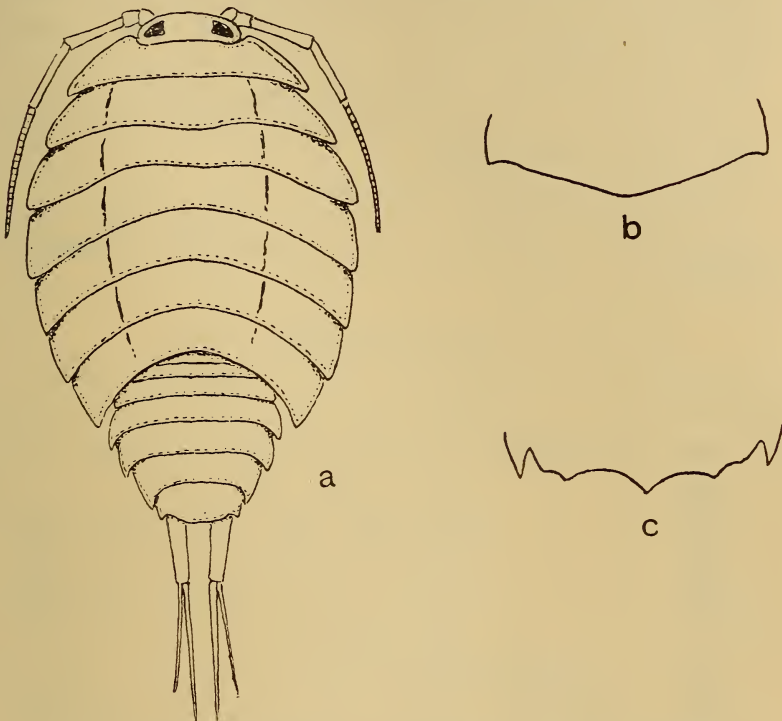


FIG. 3.—*Ligia*. a, *dilatata*; b, c, apical margin of telson of *natalensis* and *exotica* respectively.

♂ 22 × 15 mm., ovigerous ♀ 17 × 9 mm. Greenish-brown or olivaceous, uniform, eyes black.

Localities.—Cape Province: West and east shores of Cape Peninsula (W. F. P. and K. H. B.); Kleinmond, mouth of Bot River, Caledon Div. (K. H. B.).

Great Namaqualand: Lüderitzbucht (Budde-Lund).

Ligia dilatata var. *gracilior* n.

This form cannot be considered as more than a variety of the typical form. Both are found on the Cape Peninsula, but it has not

been determined how far, if at all, the colonies of the two forms overlap.

Adult ♂♂ scarcely grow quite as broad in comparison with the length, as in the typical form. Antenna 2 much more slender, reaching at least to end of 6th peraeon segment, peduncle reaching to end of 3rd segment, flagellum 18–22 jointed, most of the joints twice as long as broad.

Peraeopod 7, 6th joint at least 6 times as long as broad.

Uropods half or a little more than half length of body, rami nearly twice as long as peduncle.

♂ 22 × 13 mm., ovigerous ♀ 17 × 9 mm.

Localities.—Cape Province: West and east shores of Cape Peninsula (W. F. P. and K. H. B.); Dassen Island (R. M. L.); Hermanus (R. M. L.).

Ligia glabrata Brdt.

(Figs. 1, *d*; 2, *b*.)

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| 1833. | <i>Ligia glabrata</i> . | Brandt, Consp. Onisc., p. 172 (10). |
| 1843. | „ „ | Krauss, Südafr. Crust., p. 62. |
| 1885. | „ „ | Budde-Lund, Crust. Isop. Terrest., p. 263. |
| 1895. | „ „ | Dollfus, Mem. Soc. Zool. Tr., viii, p. 350. |
| 1910. | „ „ | Stebbing, Gen. Cat. S. Afr. Crust., p. 437. |
| 1922. | „ „ | Jackson, Proc. Zool. Soc., p. 692, pl. i, fig. 5, pl. ii, fig. 6. |
| 1922. | „ <i>glabratus</i> . | Stebbing, K. Ver. Handl. Goteb., xxv, p. 4. |
| 1924. | „ <i>glabrata</i> . | Panning, Beitr. Kennt. Land. Süßwasserf. S.W.A., vol. ii, p. 195, fig. 11. |
| 1928. | „ „ | Verhoeff, Zool. Anz., lxxvi, p. 123, figs. |

Body narrow-oval in both sexes, dorsal surface minutely granulate. Antennary tubercles on head as in *dilatata*. Epimera, except 1st, which is not marked off at all, indistinctly marked off by grooves. Pleon not much narrower than peraeon. Telson with distal margin evenly convex, postero-lateral angles very slightly produced.

Antenna 2 reaching end of 6th or 7th peraeon segment, peduncle slender, reaching middle or end of 3rd segment, flagellum 15–20 jointed, joints not twice as long as broad, shortly setose.

Maxilla 1, inner plate apically produced in a rounded lobe beyond the origin of the 3 stout setae. Maxilliped with inner plate apically rounded, with 2–3 subterminal short conical spines on inner margin.

Peraeopods 1-3, 5th joint ovate in ♂; 6th joint of peraeopod 7 at least 6 times as long as broad.

Penis as in *dilatata*.

Pleopod 1 in ♂, outer ramus with inner distal angle rounded. Pleopod 2, ♂ stylet slightly enlarged at base, apex spatulate, curving outwards, the margins of the seminal groove ending terminally in short points, outer distal margin thin, laminate, inner margin thickly setulose for nearly three-quarter length.

Uropods not quite half length of body, rami half as long again as peduncle, which is cylindrical with outer margin not keeled.

♂ 18 × 8 mm., ovigerous ♀ 16 × 8 mm. Grey, faintly irrorated with lighter, eyes black.

Localities.—Cape Province: Table Bay (Krauss); West shore of Cape Peninsula (W. F. P. and K. H. B.); Dassen Island (R. M. L.); Dyers Island (Stebbing).

Great Namaqualand: Lüderitzbucht (Panning).

Stebbing's record from Dyers Island (off Danger Point) is the only record from the south coast, and it is possible that his specimens should really be identified as *dilatata* var. *gracilior*.

Ligia natalensis Clg.

(Figs. 1, *d*; 2, *c*; 3, *b*.)

1920. *Ligia natalensis*. Collinge, Ann. Nat. Mus., iv, p. 474, pl. xxviii, figs. 9-18.

1922. ,, ,, Jackson, Proc. Zool. Soc., p. 700.

Body narrow-oval in both sexes, dorsal surface minutely granulate. Epimera, except first, which is not marked off at all, indistinctly separated. Pleon not much narrower than peraeon. Telson with distal margin not quite evenly convex, but very feebly angular between the quadrate, postero-lateral angles.

Antenna 2 very slender, reaching to middle or end of pleon, peduncle reaching end of 3rd peraeon segment, flagellum 20-24 jointed, joints twice as long as broad, shortly setose. Mouth-parts as in *glabrata*.

Peraeopods 1-3, in ♂ 5th joint ovate; 6th joint of peraeopod 7 at least 6 times as long as broad.

Penis as in *dilatata*.

Pleopod 1 in ♂, outer ramus with inner distal angle rounded. Pleopod 2, ♂ stylet slender, apically spatulate, curving outwards, apex minutely setulose, seminal groove ending laterally in indistinct

points, outer distal margin thin, laminate, but not so abruptly expanded as in *glabrata*, inner margin setulose from base to apex.

Uropods not quite half length of body, rami half as long again as peduncle, which is cylindrical, outer margin not keeled.

♂ 12 × 5 mm., ovigerous ♀ 12 × 6 mm. Slaty-grey, irrorated with lighter, eyes black.

Localities.—Cape Province: Victoria Bay, George (S. H. H. and C. T.); Knysna (R. M. L.); Keurbooms River (K. H. B.); Port Elizabeth (S. Afr. Mus.); East London (R. M. L.).

Natal: Umhlali (N. of Durban), Winkle Spruit (S. of Durban) (Collinge).

Ligia exotica Roux.

(Figs. 1, *b*; 2, *d*; 3 *c*.)

1828. *Ligia exotica*. Roux, Crust. Medit., pt. 3, pl. xiii, fig. 9.
 1905. *Ligyda* ,, Richardson, Bull. U.S. Nat. Mus., No. 54,
 p. 676, figs. 716–718 (synonymy).
 1909. *Ligia* ,, Budde-Lund in Voeltzkow, Reise, ii, p. 303.
 1916. ,, ,, Chilton, Mem. Ind. Mus., v, p. 462, figs. 1–22.
 1920. *Ligyda* ,, van Name, Bull. Amer. Mus. Nat. Hist.,
 xliii, p. 72, figs. 27–30.
 1922. *Ligia* ,, Jackson, Proc. Zool. Soc., p. 693, pl. ii, fig. 10.
 1924. ,, ,, Panning, Beitr. Kennt. Land. Süßwasserf.
 S.W.A., ii, p. 196, fig. 11, *m*.
 1927. ,, ,, Arcangeli, Boll. Zool. Portici, xx, p. 268.

Body narrow-oval in both sexes, dorsal surface granular. Epimera distinctly separated. Pleon not much narrower than peraeon. Telson, distal margin with sharp median triangular point, one or two short more or less sharp points between the median point and the acute postero-lateral points.

Antenna 2 very long, reaching to middle or end of pleon or even beyond, flagellum 28–55 jointed, joints not twice as long as broad, shortly setose.

Maxilla 1, inner plate not apically produced beyond insertion of the terminal setae. Maxilliped with inner plate apically truncate, with several stout conical spines.

Peraeopod 1, 6th joint with small lobe-like apical process in ♂; peraeopods 1–3 in ♂ with 4th and 5th joints expanded as in *oceanica*, devoid of spines and roughened with minute oblique ridges.

Penis straight, slender, evenly tapering.

Pleopod 1 in ♂ outer ramus with inner distal angle not produced.

Pleopod 2, ♂ stylet straight, apex rounded, outer apex setulose, seminal groove opening terminally.

Uropods slightly more than half length of body, rami half as long again as peduncle, which is cylindrical with outer margin not keeled.

30 × 17 mm. Slaty-grey, eyes black.

Localities.—Natal: Durban (K. H. B.).

Portuguese East Africa: Mozambique Island (K. H. B.).

Distribution.—Warm shores of Atlantic, Pacific, and Indian Oceans. On the west coast of Africa it has been recorded from Senegal, and Banana in the Belgian Congo.

FAM. TRICHONISCIDAE.

1898. *Trichoniscidae.* Sars, *Crust. Norw.*, ii, p. 159.

1907/8. ,, *Racovitza*, *Arch. Zool. exp. gen.*, ser. 4, vols. vii and ix.

1909. ,, Budde-Lund in *Schultze, Reise*, ii, p. 67.

1922. ,, *Wahrberg, Ark. Zool.*, xv, pp. 53, 71.

Eyes small or wanting. First antenna 3-jointed. Second antenna with flagellum composed of usually not more than 6 or 7 joints. Mandible with molar, which may or may not carry a brush-like seta or penicil. Inner lobe of maxilla 1 with 3 plumose setae. Maxilliped with palp feebly jointed. Five pairs of double-branched pleopods; outer (opercular) lobes without air-cavities; inner lobe of 1st in ♂, as well as that of 2nd, modified as a copulatory organ. Uropods not opercular, exposed, but sometimes partly covered by telson. Vasa deferentia opening separately at apex of a single median penis. Five pairs of brood lamellae or segments 1–5; no cotyledons (*cf.* fig. 13, p. 226).

Although separated by Sars, the members of this family have been grouped with the *Ligiidae* by *Racovitza* and *Budde-Lund*. In view of the fundamental differences in the anterior pleopods in both sexes, especially in the ♂, it seems better to adopt Sars' classification.

The original *Trichoniscids* have been divided into a large number of genera and subgenera. The main divisions are based on the structure of the mandible. In the *Trichoniscine* and *Haplopt halmine* groups

the molar carries no penicil (not to be confused with the one or more penicils situate *between* the cutting edge or apex and the molar); in the Titanethid group such a penicil occurs on either one or both mandibles.

The South African genera are disposed as follows :—

molar without a penicil	<i>Trichoniscus, Paranotoniscus, Phylloniscus.</i>
molar with a penicil	<i>Kogmania, Titana, Schöblia.</i>

The following key, however, is based on more convenient external characters.

Key to the South African genera.

1. With eyes.
 - a. Pleuræ not developed on any segments of pleon *Trichoniscus.*
 - b. Pleuræ developed on segments 3-5 *Paranotoniscus.*
2. Without eyes.
 - a. Head produced horizontally over bases of antennæ.
 - i. Body nearly circular, depressed *Phylloniscus.*
 - ii. Body ovate, convex *Titana.*
 - b. Head not produced over bases of antennæ.
 - i. Broadly ovate, pleon not immersed in peraeon *Kogmania.*
 - ii. Nearly circular, pleon immersed in peraeon *Schöblia.*

Gen. TRICHONISCUS Brandt.

- | | | |
|---------|----------------------|---|
| 1833. | <i>Trichoniscus.</i> | Brandt, Consp. Crust. Onisc., p. 12. |
| 1857. | <i>Philougria.</i> | Kinahan, Nat. Hist. Rev., iv, p. 281. |
| 1898. | <i>Trichoniscus.</i> | Sars, Crust. Norw., ii, p. 160. |
| 1901. | „ | Verhoeff, Zool. Anz., xxiv, p. 74. |
| 1901. | „ | Chilton, Tr. Linn. Soc. Lond., viii, p. 114. |
| 1906. | „ | Budde-Lund, Deutsch. Südpol. Exp., ix,
p. 82. |
| 1907/8. | „ | Racovitza, Arch. Zool. exp. gen., ser. 4,
vols. vii and ix. |
| 1928. | „ | Jackson, Proc. Zool. Soc., i, p. 572 (mor-
phology of head). |

Eyes present, consisting usually of 3 ocelli. Pleon abruptly narrower than paraeon, the pleuræ not prominently developed. Left mandible with 2 penicils, right mandible with 1 penicil; molar in both mandibles without penicil. Inner ramus of uropod attached at postero-internal angle of peduncle, both rami ending in a tuft of setules.

There are a number of subgenera of *Trichoniscus*, chiefly characterised by differing numbers of penicils in the mandibles. The South

African species described below belong to *Trichoniscus sensu stricto* as defined above.

Some of the European species inhabit caves and grottoes, and it is interesting to find a subterranean species in South Africa.

All the South African species are monticolous. In addition to the species described below, I have found specimens of this genus on Matroosberg, Hex River Mts., and in the southern Cedarberg Mts., east of Citrusdal; but the material is too sparse to justify description. Further collecting in the mountains will certainly bring to light additional species.

Key to the South African species.

- I. Large species, 14 mm. Cavernicolous *tabulae*.
- II. Smaller species, 8 mm. or less.
 - A. Surface nitidulous.
 - 1. Smooth, non-granulate.
 - a. Telson truncate. 4.5-5 mm. *hottentoti*.
 - b. Telson rounded. 3 mm. *natalensis*.
 - 2. Granulate.
 - a. Granules irregularly arranged. 6.5 mm. *ventosus*.
 - b. Granules arranged in transverse series.
 - i. 4 series on peraeon segment 1, and 3 on each of segments 2-7. 4.5 mm. *capensis*.
 - ii. 3 series on peraeon segment 1, and 2 on each of segments 2-7. Head very convex. 4 mm. *moruliceps*.
 - B. Surface shagreened.
 - 1. Non-granulate. 5 mm. *austro-africanus*.
 - 2. Granulate.
 - a. Granules irregularly arranged. 8 mm. *georgensis*.
 - b. Granules arranged in transverse series.
 - i. 2-3 series on segment 1.
 - a. 4 mm. Brownish-grey *horae*.
 - β. 2.5-3 mm. Head and pleon pale, peraeon segments banded *cestus*.
 - ii. 5-6 series on segment 1.
 - a. 4-5 series on segments 2-7. 6.5 mm. *swellendami*.
 - β. 3 series on segments 2-7. 5 mm. *riversdalei*.

Trichoniscus tabulae n. sp.

(Fig. 4.)

Ovate, moderately convex, minutely shagreened, with scattered setules. Head without marked frontal margin, lateral lobes rather well developed; eyes composed of 3 fused ocelli.

Peraeon segments with postero-lateral angles of segments 1-3 rounded-quadrate, of segment 4 quadrate, of segments 5-7 slightly acute. Epimera without oblique keels. The epimera of segments 2-4 in ♀ appear to be not demarcated, but no actually ovigerous ♀♀ have been obtained. Pleurae of pleon segments 3-5 shortly acute, but not projecting. Telson broader than long, apex truncate.

Antenna 1 as in *pusillus* (Sars, pl. lxxii, fig. 1). Antenna 2 with

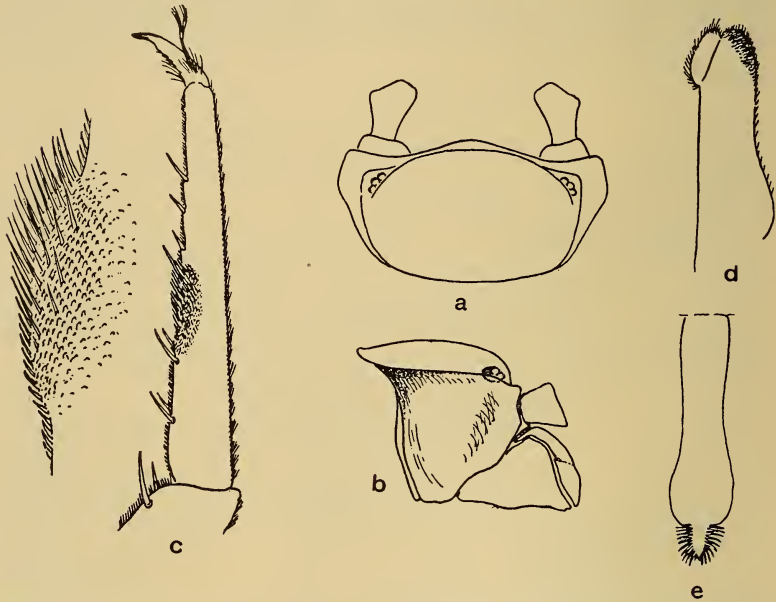


FIG. 4.—*Trichoniscus tabulae* n. sp. a, b, Dorsal and lateral views of head; c, 6th joint of peraeopod 7 ♂, with portion further enlarged (some of the spines omitted); d, maxilla 2; e, penis.

flagellum 10-11-jointed. Mouth-parts as in *pusillus*. Molar without penicil. Outer lobe of maxilla 2 distinctly demarcated.

Peraeopod 7 in ♂, 6th joint with an ovate area in middle of upper surface bearing palisade-like rows of outstanding spines.

Five pairs of brood-lamellae. Penis expanding slightly distally with an apical point bearing spiniform processes on each side. Pleopods 1 and 2 in ♂ as in *Paranotoniscus* (q.v.), the filiform stylet in pleopod 1 apically bifid; the stylet on pleopod 2 more slender and elongate, apically shortly bifid.

Uropod, inner ramus two-thirds length of outer ramus, both narrow, tipped with a few fine setules.

14 × 5.5 mm. Creamy-white, faintly and to a varying degree

suffused with brownish-grey, chiefly on epimera and mid-dorsal line ; antennae, uropods, and peraeopods pale, eyes black.

Locality.—Cape Province : Table Mt., Cape Town (K. H. B.).

This interesting species is found in the caves, known as the Wynberg Caves, on Table Mt., about 80–100 feet below the surface. It has been found only in the lowest of the series of caverns, and is completely shut off from light. The pigmentation appears to be in course of disappearing, but no actual albino specimens have been found. The eyes are as well developed as in other species, and still retain the black pigment.

The associated fauna in this cave comprises a pure white *Peripatus* (*Peripatopsis alba* Lawrence, Ann. S. Afr. Mus., xxx, p. 101, 1931), the curious Acridiid *Speleiacris tabulae* (see Ann. S. Afr. Mus., xxix, pp. 150, 273, 1929), and two species of Harvest-Spiders (see Lawrence, Ann. S. Afr. Mus., xxix, pp. 348, 422, 1931).

Trichoniscus hottentoti n. sp.

(Fig. 5, a.)

Ovate, moderately convex, smooth, nitidulous (even under a high power), with a few scattered setae which are easily lost. Head with frontal margin scarcely marked, lateral lobes small ; eyes with 3 contiguous ocelli, which often appear as if only 2.

Peraeon segments 1–3 with postero-lateral angles rounded, 4–6 quadrate, 7 very shortly produced. Epimera without oblique keels. Pleurae of pleon not projecting. Telson broader than long, apex truncate.

Flagellum of antenna 2 4-jointed. Mouth-parts as in *pusillus*, epipod of maxilliped narrowing evenly to an acute apex.

Peraeopod 7 without sexual differences.

Five pairs of brood lamellae, arising from bases of peraeopods 1–5. Penis expanding very slightly distally, with a filamentous apical point about half the length of the basal part, and minutely serrate at its base on each side (cf. fig. 6 of *Paranotoniscus*, but apical point is here longer). Pleopod 1 in ♂, outer lobe shortly triangular, broader than long, apex blunt, inner lobe with long filiform stylet (cf. *Paranotoniscus*) ; in ♀ outer lobe subtriangular, broader than long, inner lobe small, rounded. Pleopod 2 in ♂, outer lobe transversely oblong, inner lobe with 1st joint short, 2nd elongate, tapering, acute (cf. *Paranotoniscus*) ; in ♀ outer lobe as in ♂, inner lobe narrow, elongate, extending some distance beyond outer lobe, apex subacute.

Uropod, inner ramus three-quarter length of outer, both narrow.

4.5-5 × 1.5-1.75 mm. Chestnut-brown, faintly mottled with lighter marks dorsally, eyes black.

Locality.—Cape Province: Hottentots Holland Mts., 3000-4000 ft. (K. H. B., 1916); Wellington Mts., 3000 ft. (K. H. B., 1922).

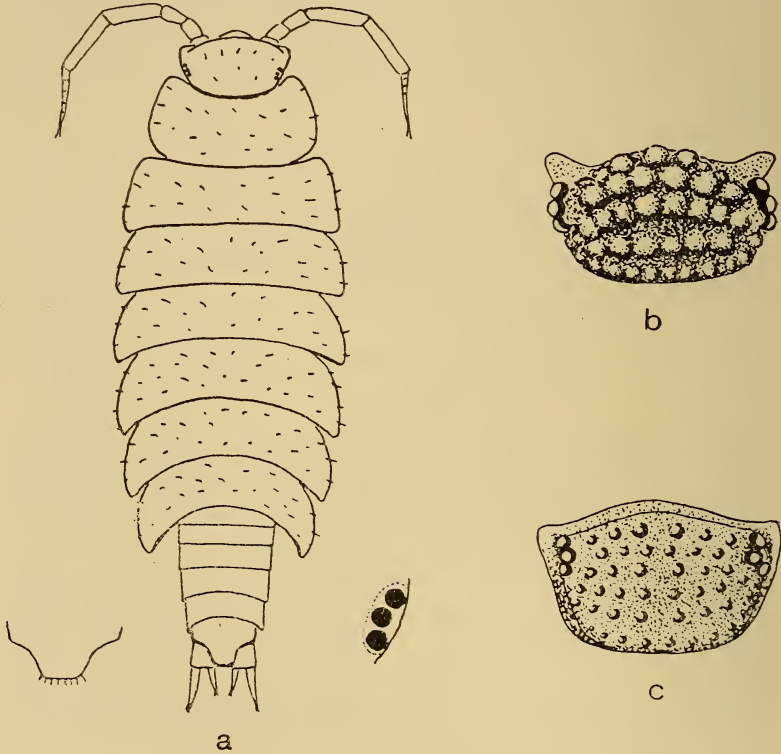


FIG. 5.—*Trichoniscus*. a, *hottentoti* n. sp. with eyes and telson further enlarged (the telson in the figure of the whole animal is drawn too long); b, head of *moruliceps* n. sp.; c, head of *swellendami* n. sp.

Except that there are faint indications of tubercles across each pereaeon segment, the Wellington Mts. specimens do not differ from those of the Hottentots Holland Mts. The difference scarcely justifies specific separation.

Trichoniscus natalensis n. sp.

Similar to *hottentoti*, but smaller, paler in colour, and with the apex of telson broadly rounded. Epimera of segments 2-4 demarcated in ♀.

3 × 1.25 mm. Pale amber or yellowish, eyes darker.

Locality.—Natal: Pietermaritzburg and Krantzkop (K. H. B., 1917, ♀♀ only).

Trichoniscus ventosus n. sp.

Ovate, smooth, nitidulous, with a few scattered short setules. Head with frontal margin scarcely marked, lateral lobes small; eyes of 3 contiguous ocelli.

Peraeon segments with minute scattered granules, not definitely arranged in transverse series.

Telson nearly twice as wide as long, apex truncate.

6.5 × 3 mm. Slaty-grey, with paler flecks and mottling, eyes black, peduncle of uropods pale.

Locality.—Cape Province: Waaihoek Mts., Goudini, Worcester District (K. H. B., 1928).

The specific name refers to the name of the locality Waaihoek = Windy-corner.

Trichoniscus capensis n. sp.

Resembling *hottentoti*, but head and peraeon with transverse series of low rounded tubercles; 3 series on head, 4 on peraeon segment 1, and 3 series on each of the other segments, the tubercles extending on to the epimera, which have no oblique keels. A single transverse series of granules is faintly indicated on pleon segment 3. Lateral lobes of head rather well developed.

4.5 × 2 mm. Whitish, with faint greyish irroration, eyes black.

Locality.—Cape Province: Table Mt., Cape Town (K. H. B., 1929).

Like *hottentoti* the specimens were collected among damp moss and earth near waterfalls.

Trichoniscus moruliceps n. sp.

(Fig. 5, b.)

Differing from *capensis* in having 3 rows of tubercles on peraeon segment 1, and 2 on each of the other segments, and in the rather more convex occiput with slightly stronger tubercles. The 3 ocelli of each eye are strongly convex and protuberant, whereas in *capensis* (and *hottentoti*) they scarcely project above the general surface of the head; the head consequently bears considerable resemblance to a mulberry.

4 × 1.5 mm. Pale greyish, faintly irrorated, eyes black.

Locality.—Cape Province: Jonkershoek Mts., Stellenbosch (K. H. B., 1924).

The single specimen was found in a Termite nest.

Trichoniscus austro-africanus n. sp.

Resembling *hottentoti*, but larger and with the surface distinctly shagreened. Penis rather more strongly expanded apically, just before the terminal point.

5 × 2.25 mm. Brownish, faintly marbled, eyes black.

Locality.—Cape Province: Table Mt., Cape Town (K. H. B.).

Found in damp moss near streams and runnels.

Trichoniscus georgensis n. sp.

Ovate, shagreened, with a few scattered setules. Head with frontal margin obsolete, lateral lobes well developed, subacute; 3 ocelli in a triangle.

Peraeon and pleon segments with numerous small irregularly arranged granules. Telson twice as broad as long, apex truncate, postero-lateral angles rather sharply quadrate.

8 × 3.25 mm. Slaty-grey, with paler mottling and a pale lateral stripe along the junctions of epimera with their segments, eyes black, peduncle of uropods grey, legs suffused.

Locality.—Cape Province: George (K. H. B., 1931).

Found among humus in the wooded kloofs on the mountain slopes, 2500–3000 ft.

Trichoniscus horae n. sp.

Surface minutely shagreened, with scattered setae. Head smooth, frontal margin not marked, lateral lobes small; eye composed of 3 ocelli, in line on the margin.

Peraeon segment 1 with 2 transverse rows of small rounded tubercles, 6 in each row, and a series of minute granules on hind margin; segments 2–7 each with a single row of 6 tubercles, and minute granules on hind margin. Epimera of segments 2–7 each with a single tubercle in the centre, no oblique keels. Epimera 2–4 very clearly demarcated from their segments in ♀.

Telson broader than long, apically broadly rounded.

4 × 1.75 mm. Brownish-grey, irrorated with paler, eyes black.

Locality.—Cape Province: Swellendam Mts. (K. H. B., 1925, ♀♀ only).

Named after the "Clock" peaks in the vicinity of Swellendam.

Trichoniscus cestus n. sp.

Similar to *horae*, but smaller and differently coloured.

2.5-3 × 1.25-1.5 mm. Head, peraeon segment 1 and the pleotelson pale cream; peraeon segments 2-7 each with a brownish-grey transverse band, which anteriorly is much broken up by pale streaks and spots, the anterior margin being quite clear of dark colouring; eyes black; antennae grey, legs more or less suffused.

Locality.—Cape Province: Riversdale Mts. (K. H. B., 1926).

A pretty and distinctively marked little species.

Trichoniscus swellendami n. sp.

(Fig. 5, c.)

Minutely shagreened. Head without marked frontal margin, lateral lobes moderate; eyes of 3 contiguous ocelli in a triangle; dorsal surface of head with about 6-7 transverse rows of evenly spaced small rounded granules.

Peraeon segment 1 with 5-6 transverse series of small granules; segments 2-7 each with 4-5 series. Epimera without oblique keels.

Pleurae shortly acute, adpressed. Segments 1-3, and less conspicuously also 4, with a transverse series of small granules on hind margin.

Telson broader than long, subtriangular, apex narrowly truncate (but owing to the pale semi-transparent border appearing at first sight to be subtriangular).

6.5 × 2.5 mm. Slaty-grey, head and peraeon variegated with paler, the margins of the segments clearly marked with paler, pleon uniform, eyes black.

Localities.—Cape Province: Swellendam and Riversdale Mts. (K. H. B., 1925 and 1926).

Collected in damp earth and debris at heights of 3500-4000 ft.

Trichoniscus riversdalei n. sp.

Surface minutely shagreened, without setae. Head granulate, frontal margin not marked, lateral lobes moderate, eyes of 3 ocelli arranged nearly in line on margin.

Peraeon segment 1 with 5 transverse series of small rounded tubercles; segments 2-7 each with 3 series, which are continued on to the epimera. Epimera without oblique keels.

Pleon segments 1-3 with minute granules along hind margin ; indications of similar granules also on segments 4 and 5.

Telson broader than long, apically truncate.

5 × 2.5 mm. Pale greyish-cream, eyes black.

Locality.—Cape Province : Riversdale Mts. (K. H. B., 1926).

Paranotoniscus, n.g.

Eyes consisting of 3 ocelli. Antero-lateral angles of head acute. Epimera more or less discontinuous ; 2-4 demarcated in (ovigerous) ♀. Pleurae of pleon segments 3-5 expanded. Mouth-parts and uropods as in *Trichoniscus*.

This genus closely resembles the New Zealand genus *Notoniscus* Chilton (1915, J. Linn. Soc. Lond., xxxii, p. 418), but has better developed pleurae on the 3rd pleon segment, and thus resembles *Haplophthalmus*. Both *Notoniscus* and the present genus differ from *Haplophthalmus* in having 3 ocelli and acute antero-lateral angles of head.

All the species are found in wooded kloofs on the mountains.

Key to the species.

1. Peraeon with 6 series of dorsal tubercles. Pleurae of pleon segment 3 not reaching the marginal outline.
 - a. Pleon segments 1-3 each with 2 dorsal tubercles, segments 4 and 5 each with one tubercle *capensis*.
 - b. Pleon segments 1, 2, 4, 5 without tubercles, segment 3 with a transverse series of 6 tubercles *tuberculatus*.
2. Peraeon with 2 (main) series of dorsal tubercles. Pleurae of pleon segment 3 reaching the marginal outline.
 - a. Length more than twice breadth *montanus*.
 - b. Length twice breadth.
 - i. Pleon segment 1 with medio-dorsal tubercle. No tubercles on hind margin of head *latus*.
 - ii. Pleon segment 1 without tubercle. Head with 2 tubercles on hind margin *ornatus*.

Paranotoniscus capensis n. sp.

(Fig. 6, a-d.)

Elongate-oval, central portion of dorsum convex. Head with prominent medio-frontal tubercle, followed by a large rounded, obscurely tri-tuberculate tubercle, behind which are 2 rounded tubercles ; antero-lateral angles subacute. Eyes with 3 prominent, equidistant

ocelli. Antero-lateral angles of peraeon segment 1 reaching to eyes, rounded; epimera discontinuous; dorsal surface with 6 series of longitudinal tubercles, of which the outermost is the least conspicuous and nearer to its neighbour than the latter is to the submedian tubercle. Pleon segments 1 and 2 with pleurae not developed, segment 3 with acute triangular pleura not forming part of the marginal outline; segments 4 and 5 with well-developed subacute pleurae. Segments 1-3 each with 2 submedian dorsal rounded tubercles; segments 4 and 5 each with a median elongate tubercle

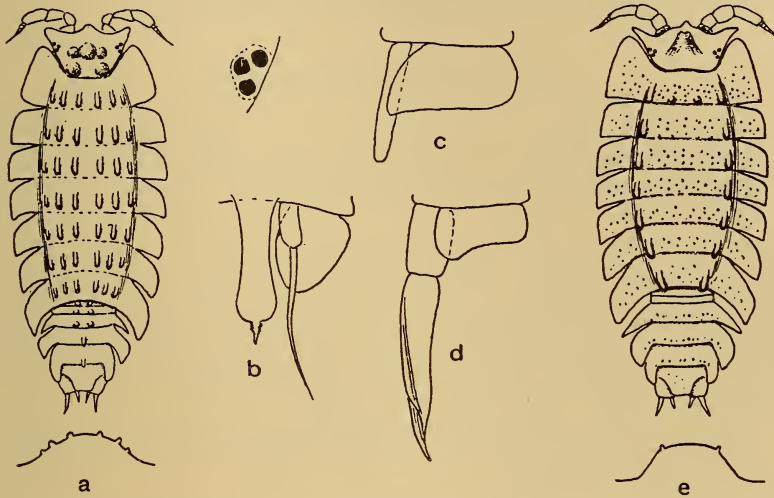


FIG. 6.—*Paranotoniscus* n.g. a, Whole animal of *capensis* n. sp., with eye further enlarged, and diagrammatic cross-section of peraeon; b, penis and pleopod 1 ♂; c, pleopod 2 ♀; d, pleopod 2 ♂; e, whole animal of *montanus* n. sp., with diagrammatic cross-section of peraeon.

slightly overhanging the posterior margin. Telson rather broader than long, apically truncate.

Antenna 1, 1st joint stout, 2nd one-third as long as 1st, 3rd as long as 2nd but abruptly narrower, tipped with 3-4 setules. Antenna 2 stout, 5th joint longer than 4th, flagellum shorter than 5th joint, 4-jointed. Epipod of maxilliped apically subacute.

Peraeopod 7 without sexual differences. Five pairs of broad lamellae arising from bases of peraeopods 1-5. Penis stout, slightly dilated apically, with small apical point which is laterally serrate.

Pleopod 1 in ♂, outer lobe subtriangular, inner lobe narrow, with long filiform stylet; in ♀ not observed, probably very small. Pleopod 2 in ♂, outer lobe short, transverse, inner lobe stout, 2nd joint tapering

to acute apex; in ♀ outer lobe short, transverse, inner distal angle shortly and subacutely produced inwards, inner lobe moderately elongate.

Uropod, peduncle broad, outer margin straight, outer ramus stout, inner ramus attached near base of inner margin, shorter than outer ramus.

3.5 × 1.5 mm. Pale brown or straw colour, eyes black.

Locality.—Cape Province: Table Mt., Cape Town, 2000–3000 ft. (K. H. B.).

Found under stones in damp places, and in damp moss.

Paranotoniscus tuberculatus n. sp.

Resembling *capensis*, but surface more densely and strongly setulose and papillose; head strongly convex, without distinct large tubercles, but thickly covered with small tubercles. Peraeon segments with 6 series of tubercles and with additional smaller intervening tubercles, especially on 1st segment. Epimera with an oblique ridge bearing several minute granules. Pleon less strongly convex medio-dorsally than in *capensis*; pleon segments 1 and 2 without tubercles, segment 3 with a transverse series of 6 tubercles, the outermost one smallest; pleurae of segment 3 not reaching marginal outline.

2.5 × 1.25 mm. Pale brown, eyes black.

Locality.—Cape Province: Langeberg Range, north of Heidelberg, 2000 ft. (K. H. B., 1927).

Paranotoniscus montanus n. sp.

(Fig. 6, e.)

Elongate-oval, rather strongly convex, minutely granulate and closely setose and papillose, especially near margins. Head with prominent medio-frontal point, followed by a large median tubercle which is apically obscurely bifid; antero-lateral angles acute. Antero-lateral angles of peraeon segment 1 reaching beyond eyes almost to apices of lateral angles of head. Epimera not so markedly discontinuous as in *capensis*. Dorsum with two series of longitudinal tubercles, more prominent posteriorly, segment 1 also with 2 submedian rounded tubercles. Pleurae of pleon segment 3 acutely triangular, reaching to marginal outline of segments, 4 and 5 well developed.

In other respects resembling *capensis*.

5 × 2 mm. Pale slaty-grey or chestnut, eyes black.

Locality.—Cape Province: Hottentots Holland Mts., 4000 ft. (K. H. B., 1916).

Found in damp moss near waterfalls.

Paranotoniscus latus n. sp.

Resembling *montanus* but broader, the width equal to half the length, head more deeply sunk in 1st peraeon segment, a median tubercle on hind margin of 1st pleon segment, and the ocelli placed more in a straight line, the hinder two in contact or even fused.

8 × 4 mm. Pale brown or straw-colour.

Locality.—Cape Province: Oudebosch, River Zonder End Mts., Caledon Div. (K. H. B., 1919, 1920, 1928).

Found among damp leaves and humus. Young examples of the same size as *montanus* are easily distinguished by the greater breadth.

Paranotoniscus ornatus n. sp.

Surface much more strongly granulate and papillose than in *latus*, and with additional tubercles. Two tubercles on hind margin of head, one on outer flanks of the dorsal tubercles on segments 1-5, and one at junctions of epimera with their segments on all peraeon segments, these latter tubercles more prominent anteriorly. Pleon with a definite though rounded median ridge, without tubercle on 1st segment, but with a slightly raised hump on segments 4 and 5.

7 × 3.5 mm. Brownish, eyes black.

Locality.—Cape Province: Wellington Mts., 2000-3500 ft. (K. H. B., 1922, 1924, 1931).

Gen. PHYLLONISCUS Purcell.

1903. *Phylloniscus*. Purcell, Trans. S. Afr. Philos. Soc., xiv, p. 409.

Subcircular, depressed. Head broad, subsemicircular, produced horizontally forwards and entirely concealing bases of antennae. Eyes absent. Peraeon segment 1 transverse, not embracing head. Epimera lamellate. Pleon not much narrower than peraeon (except segments 1 and 2); pleurae well developed. Telson broader than long. Right mandible with 1 penicil, left mandible with 2 penicils, molar without penicil in both mandibles. Inner lobe of 1st maxilla with 2 unequal subterminal setae. Inner lobe and palp of maxilliped very short,

epipod obsolete. Peraeopod 7 with sexual differences. Pleopod 1 in ♀ obsolete; inner (branchial) lobe of pleopod 3 rudimentary or obsolete, of pleopods 4 and 5 considerably smaller than outer (opercular) lobe. Inner ramus of uropod lamellate, bearing a single strong spine-seta on inner distal angle, outer ramus terete, with apical tuft of setae.

Budde-Lund's supposition (1909) that this genus should belong to the "Ligiidae" rather than to the *Oniscidae* has proved to be correct. It is closely allied to *Titana* as regards the inner lobe of 1st maxilla, the maxilliped with the obsolete epipod, and the structure of the apical joint of 1st antennae. The mandibles, however, have no penicil on the molar, and therefore, if so much importance be attached to this character, *Phylloniscus* does not belong to the Titanethid group at all.

Phylloniscus braunsi Purcell.

(Fig. 7.)

- | | | |
|-------|-------------------------------|---|
| 1903. | <i>Phylloniscus braunsi</i> . | Purcell, <i>loc. cit.</i> , p. 410, figs. 1-3. |
| 1908. | „ „ | Wasman in Schultze, <i>Reise</i> , i, p. 444, pl. xxia, fig. 6. |
| 1909. | „ „ | Budde-Lund in Schultze, <i>Reise</i> , ii, pl. lxxv. |
| 1910. | „ „ | Stebbing, <i>Gen. Cat. S. Afr. Crust.</i> , p. 438. |

Surface minutely granular. Head with 13-15 radiating ribs, counting one on each postero-lateral margin, central basal part with 3 rows of tubercles, the hindermost row being the most regular and consisting of 6 tubercles. Peraeon segment 1 with 2 rows of tubercles, segments 2-7 each with one row, in which often larger and smaller tubercles alternate. Epimera with 1 rib near anterior margin, and one oblique running to postero-lateral corner. Pleon segments 1-5 each with one row of tubercles, the rows on segments 2-5 without a median tubercle. Pleurae with 2 ribs like the epimera. Telson broader than long, apically rounded (when viewed flat), with 2 longitudinal ribs (when viewed obliquely from above these ribs cause the apex to appear emarginate, as described by Purcell).

Third joint of antenna 1 longer than either 1st or 2nd joints, curved outwards, with numerous papillae on its inner distal surface, comparable with those in *Titana mirabilis* (*cf.* Budde-Lund, 1909, pl. vii, fig. 4). Second maxilla without trace of a lobe on outer distal margin.

Peraeopod 7 in ♂, inner distal angle of 3rd joint with a projecting

lobe set with fine spinules on its margin. Five pairs of brood lamellae arising from bases of paeopods 1-5. Penis narrow lanceolate, apex acute.

Pleopod 1 in ♂, outer lobe triangular, apex subacute and curving gently outwards, inner lobe narrow with a fine filiform stylet. Pleopod 2 in ♂, outer lobe small, ovate, inner lobe stout, apically acute.

Uropod, inner ramus widening slightly distally, upper surface slightly concave, the inner margin slightly costate.

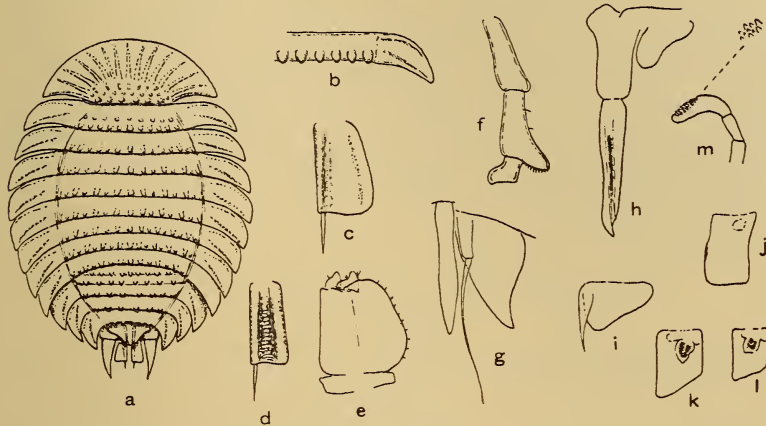


FIG. 7.—*Phylloniscus braunsi* Purcell. *a*, Whole animal; *b*, portion of peraeon segment of var. *eutheles* n.; *c*, *d*, uropod of typical form and of var. *eutheles*; *e*, maxilliped; *f*, 2nd-4th joints of paeopod 7 ♂; *g*, penis and pleopod 1 ♂; *h*, pleopod 2 ♂; *i*, pleopod 2 ♀; *j*, *k*, *l*, pleopods 3-5 respectively; *m*, antenna 1.

8 × 7 mm. Cream of whitish.

Localities.—Cape Province: Willowmore and Matjesfontein (Purcell); Laingsburg (R. M. L.); Grahamstown (S.A. Mus.); Garies, Namaqualand (A. J. H.).

Found in the galleries of *Termes viator* and *mossambicus*.

Var. *eutheles* n.

Some specimens from Upington, collected by Father Sollier, resemble the typical form except in the following respects: all the ribs and tubercles are much stronger and more prominent, the tubercles are all of the same size, and stand up on the peraeon segments like rounded buttons; the inner ramus of the uropod is nearly parallel-sided, both inner and outer margins costate, and the upper

surface therefore distinctly grooved. These features are found in the young as well as the adults.

7.25 × 5.75 mm. Creamy white.

The host is not recorded.

Gen. TITANA B-L.

1909. *Titana*. Budde-Lund in Schultze, Reise, ii, p. 65.

Narrow-oval, convex. Head with frontal margin produced forwards over bases of antennae. Eyes absent. Epimera contiguous. Pleon slightly narrower than peraeon, pleurae not expanded. Telson short, rounded. Flagellum of antenna 2 3-jointed. Right mandible with 1 penicil, left mandible with 2 penicils, right molar with penicil. Inner lobe and palp of maxilliped very short, epipod obsolete. Uropod, peduncle slightly longer than broad, longitudinally grooved, rami terete, subcontiguous, with 1-2 apical setae.

Titana mirabilis B-L.

(Fig. 8, a.)

1909. *Titana mirabilis*. Budde-Lund, *loc. cit.*, p. 65, pl. vii, figs. 1-10.

1910. „ „ Stebbing, Gen. Cat. S. Afr. Crust., p. 438.

Surface smooth. Five pairs of brood lamellae arising from bases of peraeopods 1-5.

6 × 2.5 mm. Creamy white.

Localities.—Cape Province: Steinkopf, Namaqualand (Budde-Lund); Upington (S.A. Mus.); Willowmore (S.A. Mus.).

Collected by Dr. Schultze in the nests of *Termes viator*, and by Father Sollier in company with *Phylloniscus braunsi* var. *eutheles*, host unrecorded. The specimens from Willowmore collected by Dr. Brauns are all small and immature, and no host is recorded.

Kogmania n.g.

Broadly oval, depressed. Head with frontal margin raised into a prominent ridge, but not produced forwards over bases of antennae. Eyes absent. Epimera lamellar. Pleon not abruptly narrower than peraeon (except segments 1 and 2), segments 3-5 with well-developed pleurae. Telson short, subtriangular. Peraeopod 7 without sexual

differences. Right mandible with 1 penicil, left mandible with 2 penicils, right molar with penicil. Uropod, rami close together, unequal, tipped with setae.

This genus belongs to the Titanethid group, being closely allied to *Titana* as regards the mandibles.

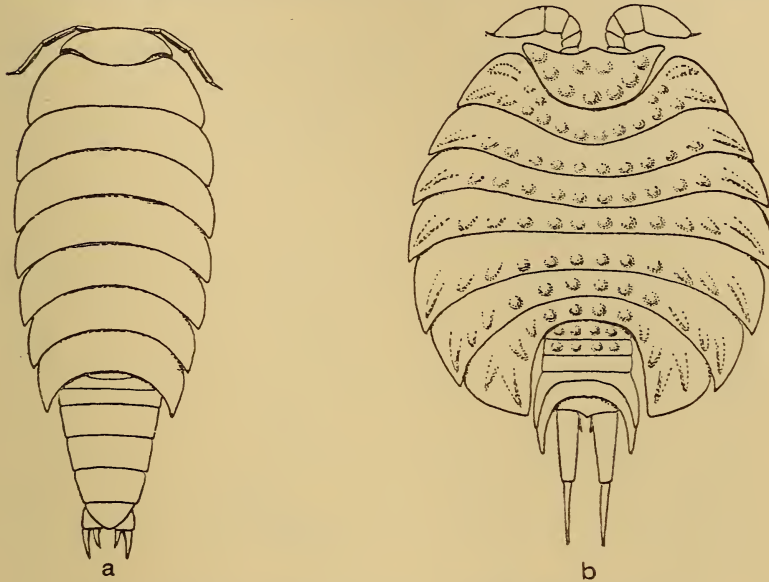


FIG. 8.—*Titana mirabilis* B-L. (left). *Schöblia fulleri* Silv. (after Silvestri) (right).

Kogmania depressa n. sp.

(Fig. 9.)

Surface minutely granular. Anterior margin of head nearly twice as wide as base, raised into a prominent transverse ridge, arcuate and curving ventrally in the middle. Head and pereaeon segments each with 2 very low transverse ridges which are feebly tuberculate. Pleon segments 1 and 2 each with a transverse row of feeble tubercles. Telson broader than long, apically rounded in ♂, almost subacute in ♀.

Antenna 1, 3rd joint tipped with a bunch of stiff hooked setae. Antenna 2 stout in ♀ but broken, only two short joints of the flagellum remaining. Inner lobe of maxilla 1 with one subterminal seta. Maxilliped as in *Haplophthalmus* (Sars, 1898, pl. lxxiv), but palp without visible joints, inner lobe narrow, epipod tapering to an acute apex.

Peraeopods stout, not strongly spinose. Five pairs of brood lamellae arising from bases of peraeopods 1-5. Penis tapering evenly.

Pleopod 1 in ♂, outer lobe triangular, inner lobe filiform; in ♀ small. Pleopod 2 in ♂, 2nd joint of inner lobe apically acute; in ♀

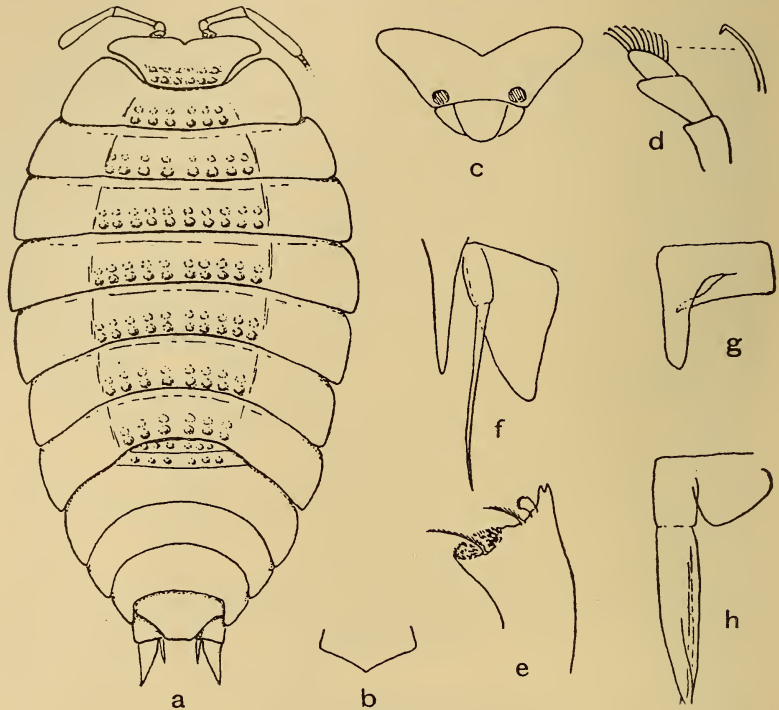


FIG. 9.—*Kogmania depressa* n.g., n. sp. a, Whole animal ♂; b, telson ♀; c, front view of head; d, antenna 1; e, right mandible; f, penis and pleopod 1 ♂; g, pleopod 2 ♀; h, pleopod 2 ♂.

outer lobe small, pointed, and directed transversely inwards, inner lobe narrow elongate, apically blunt.

Uropod, peduncle broader than long, rami arising on distal margin at same level and close together, outer ramus broad, basal width $2\frac{1}{2}$ in length, inner ramus half length of outer, narrow, both tipped with setae.

5 × 3 mm. Creamy white.

Locality.—Cape Province: Kogmans Kloof, Montagu (K. H. B., 1922).

Found under a stone in gallery of a Termite nest.

Gen. *Schöblia* B-L.

1909. *Schöblia*. Budde-Lund in Schultze, Reise, ii, p. 65.

1918. *Termitoniscus*. Silvestri, Boll. Lab. Zool. Portici, xii, p. 290.

Circular, depressed. Head not produced forwards over bases of antennae. Eyes absent. Peraeon segment 1 embracing sides of head; segment 7 embracing pleon. Epimera lamellate. Pleon much narrower than peraeon, pleurae developed into backwardly directed points on segments 3-5 or 4 and 5. Telson transverse, very short. Second antenna with very stout peduncle, flagellum minute, 2-3-jointed. Right mandible with 1 penicil, left mandible with 2 penicils, left molar only with penicil (Budde-Lund), both molars with penicils (Silvestri). Inner plate of 1st maxilla with 3 unequal setae. Maxilliped with basal joint produced on outer distal angle, palp conical (obscurely 2-jointed, Silvestri), inner plate slender, epipod obsolete. Peraeopods similar (δ unknown). Uropod, peduncle elongate, cylindrical, outer ramus subequal in length, tipped with minute setules, inner ramus attached ventrally near base of peduncle, short, tipped with one seta.

Termitoniscus is clearly synonymous with *Schöblia*, though the two species are distinguishable. The only differences are in the molar penicil, which according to Budde-Lund is present in the left mandible, but in both mandibles according to Silvestri ("mola et appendice eidem mandibulae laevae similibus," but fig. II, 6, does not show the molar penicil very clearly); and in the pleon, of which segments 3-5 are shown produced in Budde-Lund's figure of *circularis*, whereas Silvestri states that only segments 4 and 5 are produced in *fulleri*. With such extraordinarily close resemblances in other respects the union of the two genera is imperative. In fact when more abundant material comes to hand it may prove that only one species should be recognised.

Key to the species.

1. Pleon segments 3-5 acutely produced. 5 tubercles on posterior margin of head.
3 tubercles on pleon segments 1 and 2 *circularis*.
2. Pleon segments 4 and 5 acutely produced. 7 tubercles on posterior margin of head. 4 tubercles on pleon segments 1 and 2 *fulleri*.

Schöblia circularis B-L.

1909. *Schöblia circularis*. Budde-Lund, loc. cit., p. 66, pl. vii, figs. 11-21.

The specific characters are indicated in the key ; in other respects the tubercles are in agreement with those of the following species.

2 × 2 mm. White.

Locality.—Portuguese East Africa : Quilimane (Budde-Lund).

Collected by Dr. Stuhlmann from nest of *Termes monodon*.

Schöblia fulleri (Silv.).

(Fig. 8, b.)

1918. *Termitoniscus fulleri*. Silvestri, *loc. cit.*, p. 292, figs. 1, 2. (Also published in Ann. R. Scuola Agric. Portici, xv.)

3 × 3 mm. Straw coloured.

Locality.—Portuguese East Africa : Beira (Silvestri).

Collected by Claude Fuller from nest of *Termes bellicosus* f. *mossambica*.

FAM. TYLIDAE.

1885. Budde-Lund, Crust. Isop. Terr., p. 272.

1893. Stebbing, Hist. Crust., p. 423.

1910. *Id.*, Gen. Cat. S. Afr. Crust., p. 439.

Head concrete, with raised shield-like epistome. Eyes large.

Epimera of all the peraeon segments except the 1st demarcated by a distinct suture ; 4th epimeron smaller than the 2nd and 3rd ; 5th–7th epimera large.

Pleon segments distinct, not coalesced. Telson short and broad, transversely oval or subquadrangular.

Pronotum extremely narrow, linear (cf. *Pentheus officinalis*).

First antenna single-jointed, immobile. Second antenna stout, flagellum 4-jointed, the 4th joint minute.

Mandible with molar which has 1–4 plumose setae arising below its inner apex, a bunch of several (12–15) penicils between the setose pad and the molar.

Maxilla 1, inner lobe with 3 plumose setae. Maxilla 2 with only a single lobe, apically notched.

Maxilliped, inner plate apically truncate, with several penicils, palp 2–3-jointed, with groups of stout spinules.

Peraeopods stout, 6th joint in the last 3 pairs (in adult) distinctly shorter and stouter than in the anterior 4 pairs ; no sexual differences.

Dactylar seta clavate, present in young, but worn off in older examples.

First pair of pleopods rudimentary in both sexes. Pleopods 2-5 double-branched, the outer branch pleated, branchial.

Peduncle of uropod opercular, covering the anus, invisible dorsally, with a minute terminal outer ramus.

Vasa deferentia opening separately, without penes, on the thin membrane behind the sterna of 7th peraeon segment.

Five pairs of brood lamellae.

Able to roll up into a complete ball.

This family contains the single genus *Tylos*. The genus *Helleria* von Ebner, 1868 (syn.: *Syspastus*, Budde-Lund, 1879, *Syntomagaster*, Costa, 1882, and *Syngastron*, Costa, 1883), is sometimes included in the family (Budde-Lund, 1906, and Calman, 1909). Budde-Lund (1906, p. 73) regards the two genera as the extreme representatives of an ancient and isolated group. Although there are certain characters common to both (epimera 2-7 demarated, maxillae 1 and 2, maxillipeds, and uropods), nevertheless the differences are very great (in *Helleria* pleon segments 1-5 fused, mandible with only one free penicil), and it seems better to place *Helleria* in its own family, *Helleriidae*, as Budde-Lund in 1885* and Stebbing in 1893 have done. *Helleria* is a mountain woodlouse found in Italy, Corsica, Sardinia, and along the Rivieran coast (see Arcangeli, Atti Soc. It. Mus. Civ. Milan, lii, p. 481, 1914).

The presence of the epimeral sutures, mandibular molar, and 3 plumose setae on inner lobe of maxilla 1 indicate a certain affinity to the *Ligiidae* and *Trichoniscidae*; and I follow Chilton (1901) and Stebbing (1910) in placing the *Tylidae* immediately after these families.

Gen. TYLOS Aud.

- | | |
|-------------------------|---|
| 1825. <i>Tylos</i> . | Audouin, Explic. Planches Crust. Egypte, p. 287. |
| 1843. „ | Krauss, Die Südafrik. Crust., p. 63. |
| 1856. <i>Rhacodes</i> . | Koch in Rosenhauer, Die Thiere Andalusiens, p. 422. |
| 1868. <i>Tylos</i> . | von Ebner, Verh. zool. bot. Ver. Wien, xviii, pp. 104 <i>sqq.</i> |
| 1885. „ | Budde-Lund, Crust. Isop. Terr., pp. 273 <i>sqq.</i> |
| 1893. „ | Stebbing, <i>loc. cit.</i> , p. 423 (vindication of name). |
| 1901. „ | Chilton, Trans. Linn. Soc. Lond., 2nd ser., vol. viii, p. 120. |

* The names *Syspasti* B-L. or *Syspastidae* Arcangeli, 1914, are inadmissible (see Stebbing, 1893, p. 425).

1906. *Tylos*. Budde-Lund, Deutsch. Südpol. Exp., ix, p. 73 (revision).
 1909. „ Holmes and Gay, Proc. U.S. Nat. Mus., xxxvi, p. 376.
 1910. „ Stebbing, J. Linn. Soc. Lond., xxxi, p. 227.
 1910. „ *Id.*, Gen. Cat. S. Afr. Crust., p. 439.
 1922. „ Wahrberg, Ark. Zool., xv, pp. 12, 19, 45, 54 (scale-spines, 1st antenna, maxilliped).
 1924. „ Barnard, Trans. Roy. Soc. S. Afr., xii, p. 29 (gut).
 1928. „ Jackson, Proc. Zool. Soc. Lond., pp. 567, 574 (structure of head).

With the characters of the family.

The genus contains about 15 species (some of which are inadequately described) distributed over the Mediterranean, West Indies, Indo-Pacific, Japan, New Zealand, S. American and South African regions. All the species are beach-dwellers and apparently nocturnal (*v. infra*).

There are several interesting anatomical peculiarities which have not yet been thoroughly studied, owing to the difficulty of obtaining material. Apart from the difficulties of actual collecting, *i.e.* digging in the sand or visiting a particular locality after dark, the internal organs of the animals are extraordinarily difficult to preserve satisfactorily. It is necessary to make one or more insertions in the articular membranes between the segments in the living animal and pour in some strong preservative (95 per cent. strong alcohol with 5 per cent. glacial acetic is a good mixture). Some of the more important features from a taxonomic point of view may be briefly mentioned.

There are two pairs of hepato-pancreatic glands extending almost to the end of the intestine, without anterior extensions, submoniliform in appearance, the two glands on either side opening by a common lateroventral orifice into the posterior end of the stomach. For description and figure of the stomach see Barnard, 1924.

The 2nd to 5th pairs of pleopods are double branched. As Stebbing (1893, p. 423, and 1910, p. 228) remarks, von Ebner in 1868 was perfectly correct in this statement. There is indeed nothing very unusual in the pleopods except that those of pleon segment 1 are rudimentary (*cf.* von Ebner, p. 110). I find, however, that these latter pleopods are present in both sexes. In the 2nd pleopods the peduncle is much reduced; the inner ramus is small in the ♀, but in the ♂ is modified as usual into an intromittent organ. In the 3rd-5th pleopods the peduncle is well developed, and the inner

ramus in both sexes is nearly as large as the outer ramus, but quite thin (fig. 10).

Stebbing (1910, p. 228, and fig. on pl. xxiii) says the uropods are "bilaminar." Even in small specimens, not much larger than Stebbing's, there are not two distinct laminae, but only a thickening of the "opercular" plate on its dorsal (inner) surface forming a circular rim, which coincides closely with the circular opening on the under surface of the telson in which the anus is situated (fig. 11, e).

The vasa deferentia open separately, without external penes, on the delicate membrane of the 1st pleon segment in the sunken groove between the projecting and strongly chitinised sterna of peraeon segment 7 and the 2nd pleon segment. Whether they open actually

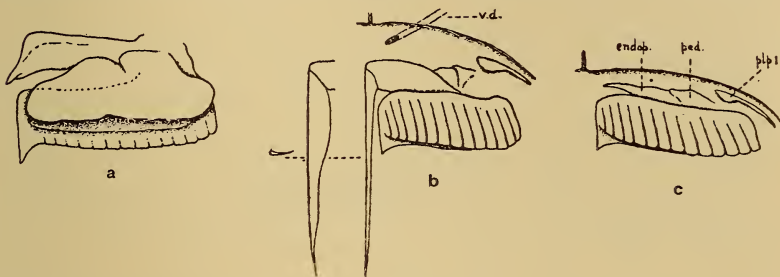


FIG. 10.—*Tylos*. *a*, Inner (dorsal) view of pleopod 3; *b*, outer (ventral) view of pleopod 2 ♂, with stylet viewed from the side and cross-section of same; *c*, outer view of pleopod 2 ♀. In *b* and *c* the hind margin of sternum of 7th peraeon segment and the rudimentary pleopod 1 are shown; in *b* also the opening of one of the vasa deferentia.

on the 1st segment is not certain, as the whole membrane between the 7th peraeon segment and the 2nd pleon segment is very delicate, and there are no definitely chitinised plates representing the sterna of the 1st pleon segment (fig. 10, *b*).

Calman (1909, Crustacea in Lankester's Treatise on Zoology, pt. 7, fasc. 3, p. 212) says it is very improbable that the vasa deferentia "perforate the copulatory appendages of the second pleopod as they have been stated to do in the *Tylidae*." This evidently refers to von Ebner's remarks (1868, pp. 108, 109), but "perforate" is an incorrect rendering of von Ebner's word "münden" ("Die Samenleiter münden . . . jederseits in das hohle Stielplättchen des zweiten Schwanzanhangs, an dem sich die Ruthe befestigt"). From the figure here given, it will be seen that the vasa deferentia discharge their contents opposite to the bases of the stylets.

Von Ebner's description of the stylets (Ruthen, or appendices

masculinae), however, is not correct. He says (*loc. cit.*, p. 108) they form long narrow "Blätte . . . welche im Innern einen Kanal führen, der an der Spitze offen endet." The shape of the stylet in the two South African species is as given in fig. 10, *b*; the dorsal edge is thick and rigid, whereas the ventral edge is thin; in cross-section the stylet is concave on the inside, *i.e.* the side adjacent to its fellow, so that the *two stylets together* form a channel for the passage of the sperm.

There are the usual five pairs of brood-lamellae (oostegites) in the ♀. As I have not yet succeeded in obtaining any actually ovigerous specimens, it cannot be stated whether the brood-pouch or marsupium projects ventrally (as in *Ligia*, etc.), or is pushed inwards as in the "conglobating" Cubarids (*cf.* p. 226 and fig. 13), nor whether cotyledons are developed or not. (But see Arcangeli, *Ann. Mus. Zool. Univ. Napoli*, vol. v, No. 33, pp. 7, 12, 15, 1929.)

Jackson (1928, p. 575) says the head appears never to have possessed a frontal line. There is, however, as Heller mentioned, a faint impressed line joining the anterior margins of the eyes, though obsolete medio-dorsally, which might well be interpreted as the frontal line.

The rarity of these woodlice in collections seems to be due to their nocturnal habits, as briefly mentioned by Budde-Lund (1906, p. 73, and 1909, *Res. Swed. Exp. Egypt and White Nile*, pt. 3, p. 11). During the day the animals remain buried at a depth of some 6–12 inches in the sand above high-water mark. There is no indication at the surface of where the animal has burrowed down, except in some cases a shallow pit $\frac{1}{2}$ –1 inch in depth. The animals lie rolled up at the bottom of their burrows. At dusk they ascend to the surface and feed on the seaweed and other vegetable matter washed up by the sea.

The subangular particles of food found in the stomach and intestine measure on an average about 1 mm. in diameter, in specimens 30 mm. in length, but some fragments may be longer: $2 \times 1 \times 0.5$ mm.

Some specimens kept for twelve hours in a damp cloth were as lively as when collected. Another batch submerged in fresh water for a similar period were comatose, but revived rapidly on removal from the water.

Key to the South African species.

1. Granulate. Ventral processes of 5th pleon segment large, nearly meeting in middle line in front of uropods, and concealing the 4th and 5th pleopods
granulatus.
2. Smooth. Ventral processes of 5th pleon segment small, not produced medianly, and only partly concealing the 5th pleopods
capensis.

Tylos granulatus Krss.

(Fig. 11, a, b.)

1843. *Tylos granulatus*. Krauss, Die Südafrik. Crust., p. 64,
pl. 4, fig. 5.
1885. „ „ Budde-Lund, Crust. Isop. Terr., p. 275.
1906. „ „ *Id.*, Deutsch. Südpol. Exp., ix, p. 75,
pl. 3, figs. 21-24.
1909. „ „ *Id.*, Schultze, Reise, ii, p. 70.
1910. „ „ Stebbing, Gen. Cat. S. Afr. Crust., p. 439.
1924. „ „ Panning, Beitr. Kennt. Land. Süsswas-
serf. S.W.A., ii, p. 172.
1924. „ „ Barnard, Ann. S. Afr. Mus., xx, p. 236.
Surface granulate. Epistome subsemicircular, length $\frac{1}{2}$ - $\frac{2}{3}$ of width.

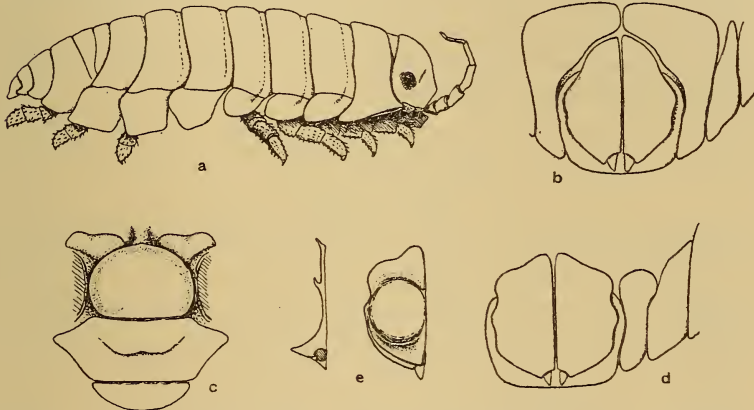


FIG. 11.—*Tylos granulatus* Krss. a, Side view of whole animal; b, ventral view of pleon segments 4 and 5 and telson. *Tylos capensis* Krss.: c, frontal view of antenna 1, epistome, clypeus and upper lip; d, ventral view of pleon segments 4 and 5 and telson; e, inner (dorsal) view of uropod, and profile of inner edge (socket of outer ramus shaded).

Inner margins of pleurae of 5th pleon segment curving inwards, the apices of the pleurae slightly overlapping the dorsal surface of telson. Apical margin of telson convex.

Ventral processes of 4th pleon segment anteriorly subacute, diverging from the ventral processes of 5th pleon segment, which are very large, subtriangularly expanded, meeting in middle line in front of the uropods, and completely concealing both the 4th and 5th pleopods.

Peduncle of uropod subtrigonal.

Up to 50 × 25 mm. Dirty-white or creamy, eyes black.

Localities.—Cape Province : Table Bay (Krauss, also W. F. P.) ; Milnerton and Melkbos Strand (K. H. B.) ; Saldanha Bay (K. H. B.) ; Hondeklip Bay (K. H. B.).

Great Namaqualand : Lüderitzbucht (Budde-Lund and Panning) ; Anichab (Budde-Lund) ; Prince of Wales Bay (Budde-Lund).

Damaraland : Swakopmund (Panning).

A fossil specimen of *Tylos* of probably late Tertiary age has been recorded from the bedded sands above the diamondiferous gravel, oyster line, at Alexander Bay, Namaqualand (Haughton, Trans. Geol. Soc. S. Afr., xxxiv, p. 27, 1931). The granulate surface of the specimen resembles that of *granulatus*, but a definite identification is precluded because the ventral side of the pleon is concealed in hard matrix.

A minute Oligochaet lives among the pleopods. It is 2·5–3 mm. in length, whitish, with 4 bundles of straight and apically simple spines on each segment, usually 3 spines in each bundle. It may be termed *Enchytraeus tyloidis* n. sp.

Tylos capensis Krss.

(Fig. 11, c, d.)

1843. *Tylos capensis*. Krauss, Die Südafrik. Crust., p. 64, pl. iv, fig. 6.
 1885. „ „ Budde-Lund, Crust. Isop. Terr., p. 276.
 1906. „ „ *Id.*, Deutsch. Südpol. Exp., ix, pp. 73, 74, pl. iii, figs. 14–18.
 1906. „ *incurvus*. *Id.*, *ibid.*, p. 79, pl. iii, fig. 41.
 1910. „ *capensis*. Stebbing, Gen. Cat. S. Afr. Crust., p. 439.

Surface minutely granulose (smooth in comparison with *granulatus*). Epistome subsemicircular, but slightly longer than in *granulatus* in proportion to its width, length $\frac{2}{3}$ – $\frac{3}{4}$ of width.

Inner margins of pleurae of 5th pleon segment nearly straight, the apices of the pleurae scarcely overlapping telson. Apical margin of telson slightly convex, or almost straight, sometimes even slightly concave.

Ventral processes of 4th pleon segment anteriorly obliquely truncate, approximate to those of the 5th segment which are small, rounded, not expanded medianly, not extending as far forwards as anterior margin of uropods, and only partly concealing the 5th pleopods.

Peduncle of uropod trapezoidal.

Up to 34 × 15 mm. Dirty-white or creamy, eyes black.

Localities.—Cape Province: Simonstown, False Bay (Budde-Lund); Somerset Strand and Gordons Bay, False Bay (Stebbing); Muizenberg and Strandfontein, False Bay (W. F. P. and K. H. B.); Kleinmond (K. H. B.); Wilderness, near George (K. H. B.); Keurbooms River, Plettenberg Bay Distr. (K. H. B.); Whitney, Alexandria Div. (S.A. Mus.); East London (R. M. L.).
Natal: (Budde-Lund; *incurvus*).

After examination of a large number of specimens, I cannot but regard Budde-Lund's figure 14 (1906) of the epistome as that of an abnormal specimen. There is very little difference between the epistomes of *granulatus* and *capensis*, the latter being only slightly less semicircular than the former.

Budde-Lund's insufficiently described *incurvus* from Natal appears to be synonymous. The concave apical margin of the telson is the only diagnostic character Budde-Lund was able to give, and many specimens of *capensis*, especially when viewed from behind and slightly from the ventral aspect, show a concave margin. The occurrence of *capensis* as far east as East London also points to the likelihood of its presence on the Natal coast. (See fig. 39.)

As regards localities, Krauss recorded this species as well as *granulatus* from Table Bay. This must be regarded as an error in labelling, as all the examples I have seen from Table Bay are *granulatus*, and all those from False Bay are *capensis*. These animals form one of the most marked differences between the faunas of the west and east sides of the Cape Peninsula. If this separation of the two species, one from Table Bay northwards and the other from False Bay eastwards, is proved to be a fact by further and more intensive collecting, it leads to the interesting, though perhaps fruitless, speculation as to why there was no transgression of one species into the area of the other when the sea was continuous across the present Cape Flats between Table Bay and False Bay.

FAM. DETONIDAE.

1853. *Scyphacinae*. Dana, U.S. Expl. Exp., p. 716.
1901. *Scyphacidae*. Chilton, Tr. Linn. Soc. Lond., viii, p. 121
(on p. 103; *Scyphaeidae* typ. err.).
1905. ,, Richardson, Bull. U.S. Nat. Mus., No. 54,
p. 671.

1906. *Detoninae*. Budde-Lund, Deutsch. Südpol. Exp., ix, p. 84.
 1910. *Detonidae*. Stebbing, Gen. Cat. S. Afr. Crust., p. 444.
 1915. *Scyphacidae*. Chilton, J. Linn. Soc. Lond., xxxii, p. 437.
 1922. „ Wahrberg, Ark. Zool., xv, p. 80.
 1927. „ Lohmander, Proc. U.S. Nat. Mus., lxxii,
 art. 17, p. 8.

First antenna, 3-jointed; second antenna, flagellum 3-4-jointed. Mandible without molar, its place taken by a tuft of setae. Inner lobe of maxilla 1 with 2 plumose setae. Maxilliped, palp well developed, longer than inner plate but obscurely jointed. Five pairs of double-branched pleopods; outer (opercular) branches without air-cavities; inner lobe of 1st pleopod in ♂, as well as that of the 2nd pleopod, modified as a copulatory organ. Uropods not opercular, exposed but partly concealed by telson, rami cylindrical. Vasa deferentia opening separately at apex of a single median penis.

The family should take its name from the earliest genus: *Deto* Guérin, 1836. The members of the family are all beach dwellers, and occur on the coasts of North America (both Atlantic and Pacific), Mediterranean, Australasia, S. Pacific Islands, South America and South Africa.

Key to the known genera.

- A. Peduncle of uropod dilated, simulating pleura of pleon.
 1. Outer lobe of maxilla 1 with strong fringe of long setae on outer distal margin *Armadilloniscus* (syn. *Actoniscus*).
 2. Maxilla 1 without such fringe * *Actaecia*.
 B. Peduncle of uropod not dilated.
 1. Outer lobe of maxilla 1 with recurved spines on inner margin *Scyphacella*.
 2. Outer lobe of maxilla 1 with the usual apical spines.
 a. Outer lobe of maxilla 1 with strong fringe of setae on outer distal margin *Scyphoniscus*.
 b. Maxilla 1 without such fringe.
 i. Eyes large, crescentic *Scyphax*.
 ii. Eyes moderate, reniform or subcircular *Deto*.
 iii. Eyes small (6 ocelli) *Detonella*.

Gen. *DETO* Guérin.

1836. *Deto*. Guérin, Mag. Zool., année vi, notice 21, p. 1.
 1906. „ Budde-Lund, Deutsch. Südpol. Exp., ix, p. 84 *sqq.*
 1915. „ Chilton, *loc. cit.*, p. 437 (monograph of genus).

* *Cf.* Nicholls and Barnes, Jour. Roy. Soc. West Austr., xii, 1926. Chilton does not mention this feature in his 1901 paper.

1922. *Deto*. Wahrberg, *loc. cit.*, pp. 11, 25, 30, 37, 44, 54, 80.
 1924. ,, Panning, Beitr. Kennt. Land. Süßwasserf. S.W.A.,
 ii, p. 183 *sqq.*
 1927. ,, Lohmander, *loc. cit.*, p. 9.
 1928. ,, Jackson, Proc. Zool. Soc., i, p. 578 (morphology of
 head).

Eyes moderate, reniform or subcircular, with numerous ocelli. Outer lobe of maxilla 1 without recurved spines on inner margin, and without strong fringe of long setae on outer distal margin. Peduncle of uropod not dilated. Five pairs of brood lamellae arising from bases of peraeopods 1-5; a single median cotyledon (see p. 226) on segments 2-5.

The typical species of the genus have the outer ramus of uropod extending much beyond the inner ramus (subgen. *Deto* B-L., 1906), and occur in South Africa, St Paul Island (Indian Ocean), and Australia. The New Zealand and South American species have the outer ramus of uropod not reaching beyond the inner ramus (subgen. *Vinneta* B-L., 1906). A further difference appears to be found in the penis (see p. 224, footnote).

Deto echinata Guérin.

(Fig. 12.)

1836. *Deto echinata*. Guérin, *loc. cit.*, p. 2, pl. xiv.
 1885. ,, ,, Budde-Lund, Crust. Isop. Terr., p. 234.
 1906. ,, ,, *Id.*, Deutsch. Südpol. Exp., ix, p. 85, pl. iv,
 figs. 37, 38.
 1910. ,, ,, Stebbing, Gen. Cat. S. Afr. Crust., p. 444.
 1915. ,, ,, Chilton, *loc. cit.*, p. 440, pl. xxxix, figs. 1-3.
 1915. ,, *acinosa*. *Id.*, *ibid.*, p. 441, pl. xxxix, figs. 4-18 (*non*
 Budde-Lund).
 1922. ,, *echinatus*. Stebbing, K. Vet. Handl. Goteb., xxv, p. 5,
 pl. i and pl. ii, A.
 1924. ,, *echinata* and *acinosa*. Panning, *loc. cit.*, p. 185 *sqq.*,
 figs. 4-9.

Chilton has figured a fully adult ♂ of the typical *echinata* form with the long incurved spines; the spines are not so strongly incurved as represented, the figure evidently intending to indicate the length rather than the actual curvature.

The species, however, grows to a much larger size than Chilton records, viz. ♂ 30 mm. (excl. uropods), ♀ 22 mm.

Panning has endeavoured to distinguish between *echinata* and *acinosa* and *armata*, but although he definitely regards *armata* as a synonym, he seems to have been unwilling to accept *acinosa* as synonymous with *echinata*. He suggests that these two very closely allied species may give rise to hybrids.

To one who has observed this remarkable woodlouse in vast numbers on the beach, and collected handfuls of examples ranging from the

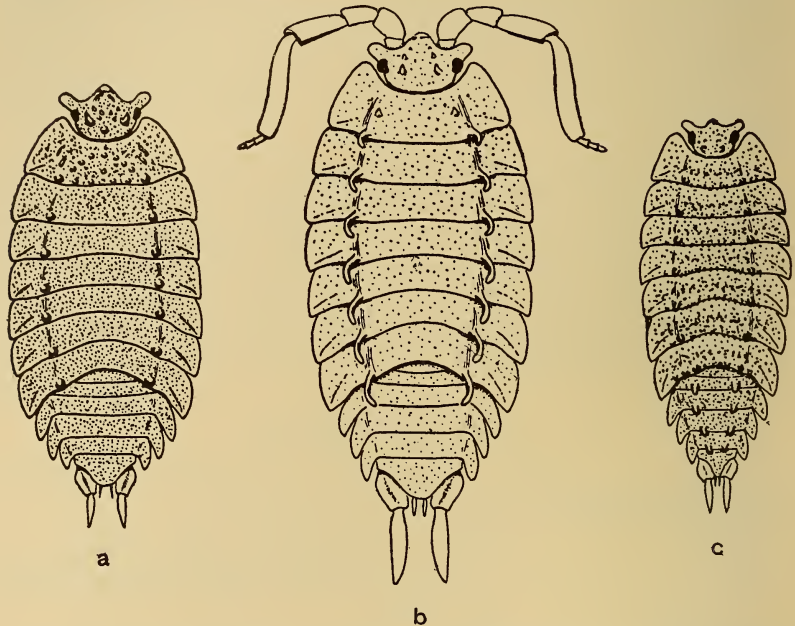


FIG. 12.—*Deto echinata* Guérin. *a, b*, ♀ and ♂ of typical form; in the latter the dorsal spines drawn sloping backwards more than they really do; *c*, ♂ of form *acinosa* (= *armata*).

newly hatched (*i.e.* freed from the brood pouch) young of 3.5 mm. up to the largest sizes, there is only one conclusion, namely, that the *acinosa* of Chilton and Panning is only the not fully grown form of *echinata*. The words “not fully grown” are used advisedly, and do not imply that such forms are not sexually mature. Females start breeding when about 13 mm. long, and males of 15 mm. have fully developed copulatory organs and are presumably also sexually mature.

The growth changes are as follows :—

Up to 8–9 mm. no trace of dorsal tubercles, except very faint beginnings of the interocular ones on head.

Up to 12 mm. the dorsal tubercles in ♂ well developed but not longer than 1 mm., in ♀ fully developed.

After reaching a length of about 15 mm. the dorsal projections in ♂ begin to assume the character of spines, and begin to curve inwards. In the largest specimens they reach a length of 6 mm. In the ♀ the projections remain as rounded tubercles.

The typical form has a pair of short tubercles in ♀, and long up-standing spines in ♂, on the head and each peraeon segment. There are often 2 or more low tubercles in front of the spines on head and 1st peraeon segment in both sexes. Pleon without spines or tubercles in both sexes. Size : ♂ up to 30 mm. × 13 mm., ♀ 22 × 9 mm.

Slaty-grey, or greenish, with lighter specks and vermiculations (see Panning, fig. 5); occasionally whole margin of body and the uropods are whitish; often a paler median stripe, which is particularly noticeable as pale patches on peraeon segments 4 and 7 in young and small specimens; eyes black.

Localities.—Cape Province: Table Bay (Krauss, Chilton, also S.A. Mus.); Hout Bay, Cape Peninsula (S.H.H., K.H.B.); Dassen Island (R. M. L.); Lamberts Bay (S.A. Mus.); Dyers Island (Stebbing, also J. D.); Hermanus (Chilton, R. M. L.).

Great Namaqualand: Lüderitzbucht (Panning).

Panning has described 18 and 20 spined forms from Lüderitzbucht along with the typical form, *i.e.* there is a pair of spines on the 3rd pleon segment, or both 3rd and 4th segments respectively.

Form *acinosa* B-L. (1885, Crust. Isop. Terr., p. 235). As described by Budde-Lund this is a smaller and more strongly granulate form than *echinata*. I have found a colony of this form at Kleinmond (C.P.) (February 1927). It is somewhat lighter in colour, with the light patches on peraeon segments 4 and 7 very distinct. Size ♂ 14 × 6 mm., ♀ 13 × 5.5 mm. I have also seen a specimen of this form from Knysna, but I failed to find any specimens of *Deto* near Keurbooms River along the shore of Plettenberg Bay (1931), or on the Natal coast (1912). Thus the most easterly locality for *Deto* is as yet Knysna (fig. 39).

Both sexes of this form are much more strongly granulate, many of the granules being more properly termed tubercles. The spiniform processes on the peraeon in the largest ♂ reach a length of 1 mm. On the posterior segments there is often an extra tubercle outside the normal one, and on segment 7 there may be thus 4 equal-sized tubercles. In addition there are in the ♂ pairs of tubercles on pleon segments 3 and 4, or 2-4, or in the largest specimens 2-5, *i.e.* there are

altogether 12 pairs of spines, as Panning found in *armata* (*loc. cit.*, p. 192, fig. 10). The copulatory appendages are exactly like those of the typical form (*cf.* Chilton, 1915, figs. 14, 15; also Budde-Lund's figure of *armata*, 1909, pl. iv, fig. 36. Contrast with Chilton's figs. 38 and 57 of *aucklandiae* and *bucculenta*).*

If any of the forms is to bear the name of *acinosa*, it would seem to be this small, strongly granulate form, but comparison with Budde-Lund's type is essential. All the examples seen by Chilton (*ex* S.A. Mus.) are typical half-grown *echinata*, and probably also all Panning's examples should be reckoned as *echinata*. There is, however, barring the smaller size (ovigerous ♀♀ from 8 mm.) and stronger granulation of the whole dorsal surface, no tangible feature which will separate *acinosa* from *echinata*.

It also seems that *armata* from St. Paul Island (Indian Ocean) is correctly regarded as synonymous with the *acinosa* form.

This woodlouse occurs in vast numbers among the rocks and boulders from between tide-marks to a short distance above high-water mark, migrating seaward with the ebb and retreating to the shelter of the larger rocks with the incoming tide. It feeds on seaweed and other objects washed up on the beach. Females with ova and broods have been observed during the summer months from November to April.

FAM. ONISCIDAE.

1885. *Oniscoidea* (part). Budde-Lund, Crust. Isop. Terr., p. 75.
 1898. *Oniscidae*. Sars, Crust. Norw., vol. ii, p. 169.
 1904. *Oniscoidea* (part). Budde-Lund, Rev. Crust. Isop. Terr.,
 p. 34.
 1905. *Oniscidae*. Richardson, Bull. U.S. Nat. Mus., No. 54,
 p. 592.
 1922. „, Wahrberg, Ark. Zool., xv, p. 86.

First antenna 3-jointed. Second antenna, sockets usually large, flagellum 1-3-jointed. Mandibles without molar, its place taken by a brush-like seta or tuft of setae. Maxilla 1, inner lobe with 2 apical plumose setae. Maxilliped, inner plate and palp small, almost rudimentary. Penis single. Five pairs of brood lamellae; coty-

* *Deto* (*Deto*) *marina*, of which I have seen examples from Freshwater Bay, agrees with *echinata* in these appendages. Thus there is a further small difference between *Deto* and *Vinneta*. *D. marina* differs from the *acinosa* form in being still more strongly granulate-tuberculate, and in having broader antero-lateral lobes (strictly speaking, antennary lobes) on the head.

ledons present (*cf.* fig. 13, p. 226). Five pairs of double-branched pleopods, outer branches with or without pseudo-tracheae. Inner branches of pleopods 1 and 2 small or sometimes obsolete. Uropods exposed, produced, extending beyond telson and pleurae of last pleon segment. Usually not able to roll up into a (complete) ball.

It is difficult to separate the *Armadillidiidae* satisfactorily from the present family. Budde-Lund (1904, p. 34) rejected his earlier division, and proposed a new arrangement of subfamilies and tribes. For the sake of convenience Sars is here followed; the Oniscids being forms which usually cannot roll up into a ball, the Armadillidiids being those which can do so.

Although this habit of rolling-up or "conglobating" is not of importance in classification, it has led to a remarkable modification in the position of the brood-pouch in the female. Budde-Lund in 1885 (p. 15) was under the impression that a brood-pouch, formed by the lamelliform oostegites arising at the bases of the pereopods (1-5), was absent in the "Armadilloidea." In 1910 (p. 11) he stated that he had found it in some species of *Armadillidium*, but admitted that negative evidence in other cases was not definite proof of its absence. Omer-Cooper (1926, p. 356) refers to the matter, and shows that in *Periscyphis* the brood lamellae or oostegites are present in ovigerous females. I do not, however, agree with the words he uses: "The young are carried in internal pouches, similar to those found in the *Sphaeromidae*, not in a marsupium formed by the oostegites below the sterna. . . ." In all the forms I have examined, and which are dealt with in this work, the eggs or young are retained in a chamber which is of exactly similar construction both in the conglobating and the non-conglobating forms. The dorsal wall of this chamber is formed by the sterna, the ventral wall by the overlapping oostegites. The only difference is one of position relative to the general shape of the body. In the non-conglobating species the brood-pouch or marsupium bulges ventrally, which obviously prevents the animal from rolling up. In the conglobating species this difficulty is overcome by pushing the whole marsupium, so to speak, into the body of the animal, whereby the gut and the hepatic tubules become considerably squeezed up towards the dorsal body-wall. The oostegites do not bulge, but lie flat, and simulate the true sternal plates. At a casual glance a female of a conglobating species is not patently ovigerous, which fact led to Budde-Lund's former erroneous impression.

The diagrams here given (fig. 13) will show at once why the use

of one term for the brood-pouch of a non-conglobating form, and another term for that of a conglobating form, is not justified. Even the extension and invagination of the membrane between the 5th and 6th sternites cannot be described as an *internal* pouch.*

From the roof of the brood-pouch, *i.e.* from the sternites, several delicate processes hang down. These processes have been termed "cotyledons" (see Zimmer, Handb. Zool., iii, pp. 728, 744, 1926-27).

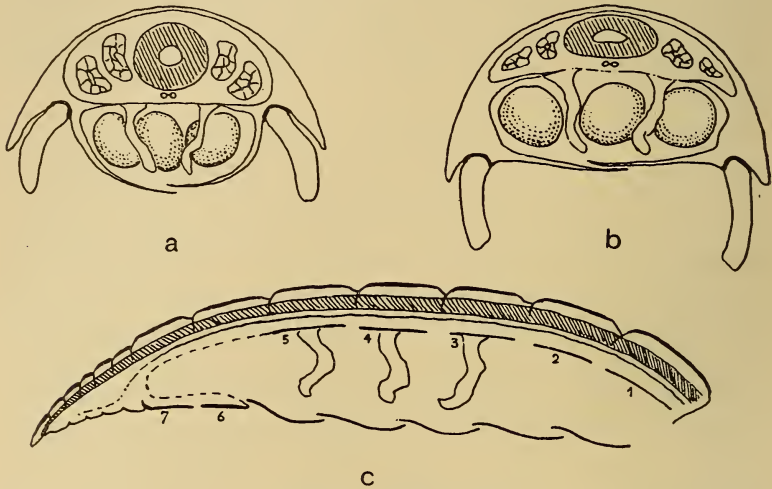


FIG. 13.—*a, b*, Diagrammatic cross-sections of peraeon of "non-conglobating" (*e.g.* *Marioniscus*) and "conglobating" (*e.g.* *Periscyphis* or *Diploexochus*) woodlice, showing gut, hepatic tubules, and cotyledons; *c*, diagrammatic sagittal section of peraeon and pleon of a conglobating woodlouse of the Cubarid type. Nerve-cord represented by a single line; sternites numbered; the dotted line indicates the invaginated extension of the sternal membrane between sternites 5 and 6.

They are always present (in the Oniscine woodlice), though varying in number and position, *e.g.* *Marioniscus spatulifrons* and *Periscyphis kunenensis* have 2-3 on each of segments 3-5, *Nahia hirsuta* and *Bethalus mucidus* have 2-3 on each of segments 2-5 (*cf.* Vandel, Bull. Biol. Fr. Belg., lix, pp. 344 *sqq.*, 1925; and also Arcangeli's remarks on the incubatory pouch, Ann. Mus. Zool. Univ. Napoli, v, No. 23, pp. 6 *sqq.*, 1929).

In order to study successfully the very numerous genera of this family, it is necessary to appreciate some of the anatomical terminology introduced by Budde-Lund. In 1910 he printed in Sjöstedt's Kilimandjaro-Meru Expedition (vol. iii, pp. 8-10), a very handy

* The pouch of the kangaroo is external.

"conspectus morphologicus generum Oniscinarum." The 1st and 5th characters employed in this conspectus can be usefully defined and figured here.

The 1st character is the number of "free" penicils or plumose setae on the mandible, which Budde-Lund explains in his 1909 paper (p. 54). Internal to the "lacinia mobilis" or secondary cutting plate is a setose pad which bears in the left mandible 2 penicils, in the right only 1 penicil. Between this pad and the molar penicil there may be either one "free" penicil (e.g. *Hiatoniscus*, fig. 32) or several penicils (e.g. *Porcellio*, fig. 21). The molar penicil itself varies in composition, as may be seen from the figures of *Philoscia* (fig. 16, a-c).

The other character (5 in the conspectus) concerns the sides of the head. In Budde-Lund's words the "partes pleurales capitii" are either "concretae" or "linea marginali verticali * decurrente manifesto discretiae" (1908, p. 296, and 1910, p. 10). Jackson (1928, p. 582), using a somewhat different terminology, describes the latter form of head as having the supra-antennal line meeting the marginal line on the antennary tubercle. But as the terms "concrete" and "discrete" are short and convenient, they are used here. In the discrete head (figs. 16k, 20, 21a, 29, 33) the marginal line curves down about below the middle of the eye, whereas in the concrete head (figs. 16l, 31, 32) it is carried forward to the anterior margin of the eye, where it is more or less distinctly joined to the supra-antennal line. These two types of head are easily observed and distinguished.

Whether all the characters used by Budde-Lund are of importance in separating genera or establishing their inter-relationships may be open to discussion. But if later authors had always taken account of his characters, there would not be several genera (e.g. *Ennurensis*, *Hemiporcellio*, or *Paraniambia*) hanging, so to speak, *incertae sedis* because the characters discussed above were not mentioned.

The structure of the penis is very uniform. That of *Porcellionides* (fig. 22) may be taken as typical. It is lanceolate in shape, more or less expanded at the apex. In cross-section it is subtrapezoidal, thick medianly, with more or less expanded lateral flanges. These lateral flanges are continued slightly beyond the (ventral) acute apex. The ventral surface, *i.e.* the surface facing the observer when

* Jackson (1926, p. 888) translates this as "marginal line of vertex," and points out that the line is not a vertical line as has been assumed. In the present context, however, Budde-Lund evidently means that the pleural parts of the head are separated by the marginal line curving downwards (more or less) vertically.

the animal is laid on its back, is smooth and even. The vasa deferentia run along the dorsal side of the penis, and in contiguity for nearly the whole length.* Distally they diverge to open by separate lateral pores. After discharge the course of the sperm would seem to be guided by a more or less well-developed groove on the distal portion of the stylet (endopod) of pleopod 1. Cf. also Arcangeli, Ric. Morfol. Biol. Anim., i, p. 2, Naples, 1927.

The stylets (endopods) of both pleopods 1 and 2 in the ♂ occasionally exhibit small and inconspicuous differences, which in some cases may be used as specific characters (cf. figs. 15, 18, 22, 25, 29, 31, 32, 33).

Key to the South African genera.

- I. The 2 plumose setae on inner lobe of maxilla 1 very short and stout (fig. 14, e)
Hora.
- II. The 2 setae more or less elongate and slender (fig. 29, e).
 - A. Epistome not bulbous. Palp of maxilliped narrowing to a more or less acute apex, with groups of setae or spinules (fig. 16, g, h).
 1. Flagellum of 2nd antenna 3-jointed.
 - a. Pleon not much narrower than peraeon, the pleurae well developed.
 - i. Convex *Alloniscus.*
 - ii. Depressed *Marioniscus.*
 - b. Pleon abruptly narrower than peraeon, the pleurae small or very small *Philoscia.*
 2. Flagellum of 2nd antenna 2-jointed.
 - a. Head discrete (figs. 16k, 20, 21a, 29, 33).
 - i. Head prominently trilobed. Telson apically produced
Porcellio.
 - ii. Head not prominently trilobed. Telson not apically produced.
 - a. Pleon distinctly narrower than peraeon. Mandible with several penicils . . . *Porcellionides.*
 - β. Pleon not much narrower than peraeon. Mandible with one penicil.
 - * Peduncle of uropod not flattened or excised externally (fig. 24). Telson dorsally impressed. Rudimentary pseudotracheae
Niambia.
 - ** Peduncle of uropod externally flattened and excised (fig. 27). Telson not dorsally impressed. No pseudotracheae *Gerufa.*
 - *** Peduncle of uropod externally keeled and distally excised (fig. 29) . . . *Inchanga.*

* Vandel's statement (Bull. Biol. Fr. Belg., lix, p. 322, 1925) that they fuse, and also his figures 2, A and B, seem to be erroneous. His fig. 12, after Friedrich, is correct.

- b. Head concrete (figs. 161, 31, 32).
 - i. Telson bluntly triangular. Eye submarginal. *Krantzia*.
 - ii. Telson apically produced. Eye marginal. *Hiatoniscus*.
- B. Epistome bulbous (fig. 33). Palp of maxilliped broad, bluntly rounded, without groups of setae or spinules (fig. 33) . . . *Rhyscolus*.

SPHERILLONINE Group.

- 1904. Budde-Lund, Rev. Crust. Isop. Terr., p. 41.
- 1908. *Id.*, in Voeltzkow, Reise, ii, p. 267.
- 1912. *Id.*, Trans. Linn. Soc. Lond., xv, p. 371.
- 1926. Omer-Cooper, Proc. Zool. Soc. Lond., p. 353.
- 1927. Jackson, Insects of Samoa (Brit. Mus.), vol. viii, pt. 3, p. 2.

The distinguishing feature of the series of genera grouped together by Budde-Lund in this subfamily is the 1st maxilla. The two plumose setae on the inner lobe are very short and stout; also there is usually a marked difference in length between the outer and inner groups of spines on the outer lobe, the outermost spine being especially long and strong.

On this character Budde-Lund considered the subfamily well characterised, but apparently there are no collateral characters, and Omer-Cooper doubts whether its separation from the Oniscine series is justified.

Jackson would dispense with the subfamily altogether because the single character of the stumpy setae on maxilla 1 is a character of no taxonomic importance, and seems to have arisen independently in various "genera" which are not otherwise closely related. I agree with Jackson, but use the above heading for the sake of quoting thereunder the relevant literature.

The genera, with short stumpy setae on maxilla 1, are mostly tropical and subtropical. Several species are known from the islands of the Indo-Pacific Ocean and Madagascar, but the species described below is the first to be found in South Africa.

Hora n.g.

Head discrete. Epimeron of 1st segment with entire margin. Epimera of segments 2-4 not demarcated (but no actually ovigerous ♀ observed). Surface with minute slender scale-spines. Telson shortly triangular.

Flagellum of 2nd antenna 2-jointed, 1st joint nearly equal to 2nd. Maxilla 1 with outer 3 spines (Nos. 1, 3, 4) on outer lobe strong, the

1st especially elongate, with a small slender spine (No. 2) at its base, the inner 4 spines much shorter, slender, apices entire; inner lobe with 2 very short and stout plumose setae, outer distal corner rounded.

Dactylar seta filiform, apically blunt.

No pseudotracheae.

Peduncle of uropod externally grooved.

This genus resembles *Paraphiloscia* Stebb., 1900 (*Pseudophiloscia* B-L., 1904), but has a 2-jointed flagellum on antenna 2.

Hora damae n. sp.

(Fig. 14.)

Surface shagreened but otherwise smooth, with scattered minute scale-spines laterally along hind margins of segments, and on telson.

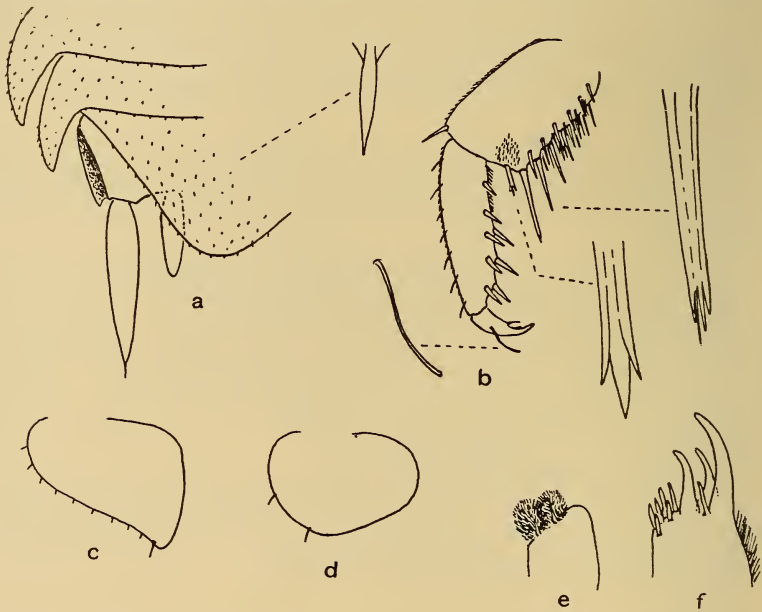


FIG. 14.—*Hora damae* n.g., n. sp. a, Portion of pleon segments 4 and 5, telson, and left uropod, with scale-spine further enlarged; b, distal joints of peraeopod 1 ♂, with spines and dactylar seta further enlarged; c, d, outer ramus of pleopod 1 ♀ and ♂ respectively; e, f, inner and outer lobes of maxilla 1.

Eyes rather small, ocelli 12.

Projecting portions of pleurae $1\frac{1}{2}$ –2 times mid-dorsal length of segments, 5 extending to level of half telsonic length. Telson with sides straight or slightly concave, apex broadly rounded.

Antenna 2 extending to end, or slightly beyond, of peraeon segment 3, slender, 4th joint almost twice 3rd, 5th equal to 3rd plus 4th, flagellum three-quarter length of 5th, its 1st joint nearly as long as 2nd.

Peraeopods 1-4 in ♂ with strong fringe of spines. Dactylar seta of all peraeopods elongate, filiform, apically blunt.

Pleopod 1, outer branch broader than long, in ♂ ovoid, apically blunt, in ♀ subtriangular, apex subacute, outer margin slightly sinuous.

Uropod, peduncle externally flattened and impressed, inner ramus about as long as external margin of peduncle, outer ramus longer.

11 × 3.5-4 mm. Slaty-grey, marbled with whitish or pale yellowish on head and peraeon, pleon uniform, antennae grey, legs and uropods more or less suffused, eyes black.

Locality.—Cape Province: Langeberg Range at Swellendam, 3500-4000 ft. (K. H. B., 1925).

The series of peaks at Swellendam are known as the "Clock" peaks, hence the generic name. This woodlouse is easily recognised by its narrow body, and a glance at the surface ornamentation, uropods, and 1st maxilla will distinguish it from the narrow-bodied *Niambia angusta*. The projecting outer spines of the 1st maxilla are very noticeable, even prior to dissection.

ONISCINE Group.

The 2 plumose setae on inner lobe of 1st maxilla are slender and more or less elongate.

Gen. ALLONISCUS Dana.

1854. *Alloniscus*. Dana, Proc. Ac. Philad., vii, p. 176.
1885. ,, Budde-Lund, Crust. Isop. Terr., p. 224.
1904. *Arhina*. *Id.*, Rev. Crust. Isop. Terr., p. 44.
1905. *Alloniscus*. Richardson, Bull. U.S. Nat. Mus., No. 54, p. 593.
1908. ,, Budde-Lund in Voeltzkow Reise, ii, p. 295 (discussion of genus).
1912. ,, *Id.*, Trans. Linn. Soc. Lond., xv, p. 385.
1915. *Arhina* Collinge, Rec. Ind. Mus., xi, p. 147.
1916. *Alloniscus*. Chilton, Mem. Ind. Mus., v, p. 474.
1922. ,, Collinge, J. Linn. Soc. Lond., xxxv, p. 108.
1928. *Arhina*. Jackson, Proc. Zool. Soc. Lond., p. 582 (morphology of head).

Convex. Head discrete. Epimera and pleurae large. Telson triangular.

Flagellum of 2nd antenna 3-jointed.

Molar represented by a tuft of setae; 1 free penicil between secondary cutting edge and the molar tuft in both mandibles.

Maxilla 1, outer lobe with all the spines simple.

Maxilliped, inner plate apically setose, with or without a small penicil on inner apex, 2nd joint of palp with 2 tufts of setae on inner margin, 3rd joint with apical tuft (see Budde-Lund, 1904, pl. vi, fig. 11; 1908, pl. xv, figs. 29, 44; and Collinge, 1915 and 1920).

Pleopods, outer branches all with pseudobranchiae.

Uropod, peduncle with outer edge entire.

In adult ♀ some of the epimera are demarcated from their segments by a groove or impressed line free of surface sculpturing.

Budde-Lund instituted the genus *Arhina* for a species which he at first considered an *Alloniscus*, and placed the genus in the "Spheriloloniae," far removed from the "Alloniscinae." Collinge (1915) considered *Arhina* closely related to *Alloniscus*, an opinion with which Jackson (1928, p. 583) concurred. That there is no character by which the two genera can be separated seems to be indicated by the fact that specimens from the Chilka Lake in India were described by Collinge in 1915 as a n. sp. of *Arhina*, and in 1916 referred independently by Chilton to *Alloniscus*.

The genus contains a number of very closely related species distributed from California through the Indo-Pacific region to Madagascar and South Africa. The animals frequent the shore.

Alloniscus marinus Collge.

(Fig. 15, a-c.)

1920. *Alloniscus marinus*. Collinge, Ann. Nat. Mus., iv, p. 476, pl. xxix, figs. 28-38.

Ovate, strongly convex, minutely granulate and setulose. Anterior margin of head sinuate, frontal margin not strong, lateral lobes small. Eyes well developed. Epistome slightly gibbous between bases of 1st antennae (cf. Budde-Lund's figure of *pallidulus*, 1909, p. 15, fig. 17). Lateral margins of peraeon segment 1 thin, not reflexed, without internal tooth or groove. Epimera of segments 2-4 in ♀ demarcated by a narrow non-granulate line (cf. *pallidulus* Budde-Lund, 1885, p. 228). Pleurae of pleon segment 5 extending to level

of telsonic apex. Telson broader than long, margins straight, apex blunt.

Peraeopods 1-4, inner margins of 4th and 5th joints with dense fringe of strong spines whose apices are bifid (*cf.* Wahrberg, 1922, fig. 7, *A. pallidulus*); in ♀ less densely spinose.

Peraeopods 5-7, 4th and 5th joints with strong spines, mostly in pairs, 6th with about 6 strong spines on inner margin; in ♀ rather less strongly spinose.

Dactylar seta of all peraeopods clavate.

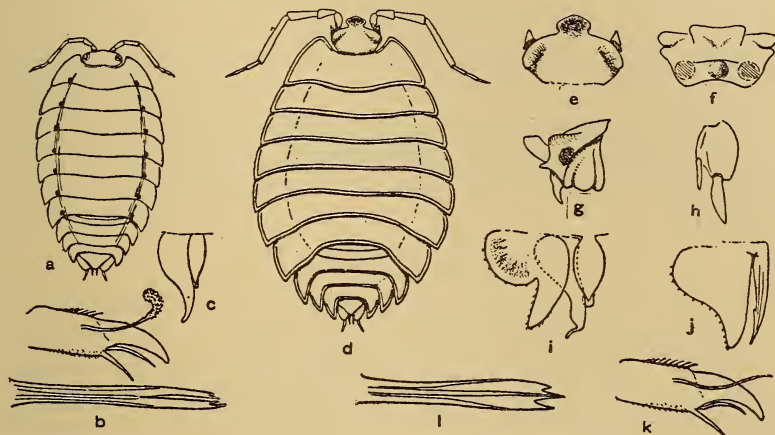


FIG. 15.—*Alloniscus marinus* Clge.: *a*, Whole animal; *b*, dactylus and spine from 5th joint of peraeopod 1 ♂; *c*, penis and pleopod 1 ♂. *Marioniscus spatulifrons* n.g., n. sp.: *d*, whole animal; *e*, *f*, *g*, dorsal, frontal, and lateral views of head; *h*, uropod; *i*, penis and pleopod 1 ♂; *j*, pleopod 2 ♂; *k*, dactylus of peraeopod 1; *l*, spine from 5th joint of peraeopod 1 ♂.

Penis and pleopods as figured by Chilton, 1916 (*cf.* also Budde-Lund, 1909, pl. xv, fig. 32, *pigmentatus*). Inner branch of pleopods 1 and 2 obsolete in ♀.

Uropod, peduncle oblong, extending a little beyond telsonic apex, outer margin straight, slightly keeled longitudinally on lower outer edge, outer ramus as long as peduncle, inner ramus slightly shorter and more slender than outer, both terete.

12 × 7 mm., alt. 4 mm. As preserved, pale yellowish, suffused with grey mottling, a black spot at junction of each peraeon segment with its epimeron, eyes black.

Localities.—Natal: Durban Bay (Collinge, and S.A. Mus.); Winkle Spruit (Collinge); Amanzimtoti (W. F. P.).
 Cape Province: Port St. Johns (S.A. Mus.).

Although closely related to *pallidulus* from the East Indies and Madagascar as regards the epistome (post-frons, Jackson), which I find is slightly gibbous and not slightly concave as Collinge says, this species would seem to be distinguished by the regular series of lateral black spots. I have seen no actually ovigerous females. Collinge's specimens and the South African Museum specimens from Durban Bay were all collected on Salisbury Island at the same time by Mr. H. W. Bell-Marley.

Marioniscus n.g.

Like *Alloniscus* but depressed, head with prominent frontal margin and lateral lobes, dactylar seta acute. Five pairs of brood lamellae.

The following species, for which this genus is proposed, apparently simulates in the development of prominences on the head the Californian species *mirabilis* and *cornutus*, hitherto included in the genus *Alloniscus*.

Marioniscus spatulifrons n. sp.

(Fig. 15, *d-l.*)

Depressed, broadly oval, broader in adult ♂ than ♀, surface minutely granulate. Head with a low rounded ridge running from the posterolateral angle to the front margin forming an "eyebrow" over the eye, front margin produced in a large ovate lobe, deeply concave dorsally, sometimes slightly angular in front, lateral lobes small, narrow, acute, laterally compressed but prominent; epistome with a low rounded median boss. Antero-lateral angles of peraeon segment 1 rounded, reaching to level of eyes. Pleurae of pleon segments 3-5 well developed, apically acute, those of segment 5 reaching slightly beyond level of telsonic apex. Telson broader than long, bluntly triangular, apex rounded.

Antenna 2 reaching to end of segment 2, 2nd joint not expanded on inner margin, 5th half as long again as 4th, flagellum shorter than 5th, 1st and 3rd joints subequal, 2nd slightly shorter.

Peraeopods 1-4, 4th and 5th joints in ♂ with dense fringe of strong spines, whose apices are trifid; in ♀ less strongly spinose.

Peraeopods 5-7, 4th-6th joints with pairs of strong spines, more numerous in ♂ than in ♀.

Dactylar seta in all peraeopods apically acute.

Penis rather broadly lanceolate.

Pleopod 1 in ♂, inner branch tapering to a narrow pointed apex,

which is turned outwards at the tip, inner branch obsolete in ♀; outer branch in both sexes with the outer margin deeply incised.

Pleopod 2, outer branch in ♂ triangular, outer margin sinuous, in ♀ less produced at inner distal angle; inner branch obsolete in ♀.

Uropod, peduncle oblong, slightly widening distally, outer margin straight, entire, rather strongly keeled, outer ramus as long as peduncle, inner ramus arising a little proximal to outer ramus and half its length, both rami terete.

♂ 16 × 10 mm., ♀ 15 × 8 mm.; alt. 2.5–3 mm. Slaty-grey, with lighter marks on head and peraeon, usually a pale medio-dorsal patch on pleon segments 1–3, the concavity of the frontal lobe on head dark grey, almost black; eyes black, antennae, legs, and uropods more or less suffused.

Locality.—Cape Province: Hout Bay, Cape Peninsula (K. H. B.).

This species, which is very distinct from typical *Alloniscus* in the shape of the body, is found on the beach under stones, in company with *Deto echinata*.

Gen. PHILOSCIA Latr.

1804. *Philoscia*. Latreille, Hist. Nat. Crust. Ins., vii, p. 43.
1885. „ Budde-Lund, Crust. Isop. Terr., p. 207.
1898. „ Sars, Crust. Norw., ii, p. 172.
1908. „ Verhoeff, Arch. Biont., ii, p. 343.
1908. „ Budde-Lund in Voeltzkow Reise, ii, p. 289
(subgenera).
1917. „ Collinge, Ann. Nat. Mus., iii, p. 576.
1922. „ Wahrberg, Ark. Zool., xv, p. 92.

Pleon narrower than peraeon, pleurae small or very small. Telson triangular, apex more or less acute, but not produced. Flagellum of 2nd antennae 3-jointed. Mandible with 1 free penicil. Peraeopods 1–4 more densely setose or spinose in ♂ than in ♀. Pleopods without or with rudimentary pseudotracheae.

The very numerous species of this genus have been distributed among a number of subgenera, with more or less satisfactory results.

In dealing with the South African representatives the characters set out by Budde-Lund have been found consistent and useful, though unfortunately it seems necessary to institute two new subgenera.

Besides the head (*cf.* p. 227), these characters are drawn from the peduncle of the uropod, the molar penicil, the spines on the outer lobe of the 1st maxilla, the inner plate of the maxilliped, and the pleurae. They are illustrated here by fig. 16.

For specific purposes the outer branch of the 1st pleopod in the ♂ may be used in conjunction with other characters; and, with the caution that an occasional individual aberration may occur, will be found reliable. For example, I have seen examples of *hirsuta*, occurring in association with typical examples, in which the proximal point bounding the excision tends to become rounded or obsolete. This

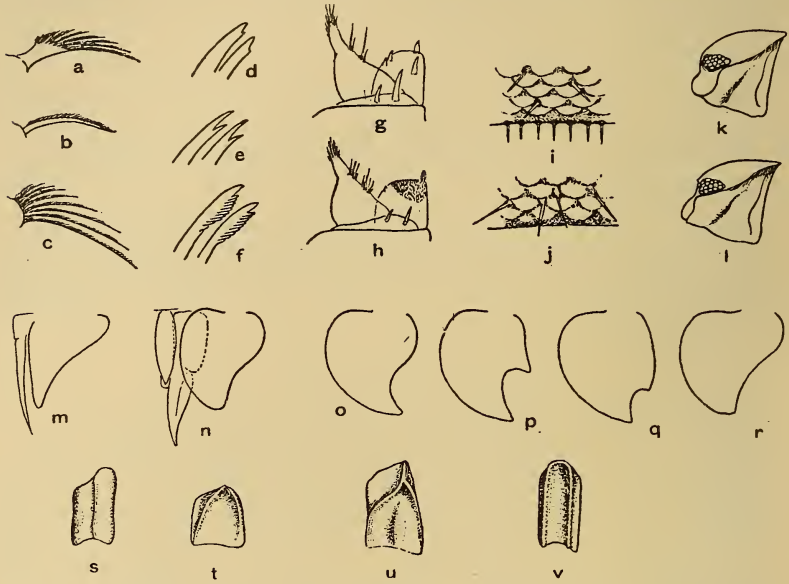


FIG. 16.—*Philoscia*. a, b, c, molar penicil of *P. muscorum*, *Setaphora*, and *Benthanops*; d, e, f, inner spines on outer lobe of maxilla 1 of *P. muscorum*, *Setaphora*, and *Benthanops*; g, h, inner plate and palp of maxilliped of *Aphiloscia* and *Setaphora*; i, j, margin of pleon segment of *Aphiloscia vilis* and *Nahia hirsuta*; k, discrete head of *N. hirsuta*; l, concrete head of *Aphiloscia vilis*; m, n, pleopod 2 ♂, and penis and pleopod 1 ♂ of *A. vilis*; o-r, outer lobe of pleopod 1 ♂ of *S. cingulata*, *N. hirsuta*, *S. demarcata*, and *Benthanops fulva* respectively; s-v, outer view of peduncle of uropod of *Komatia*, *P. muscorum*, *Aphiloscia* and *Setaphora* (also *Nahia*) respectively.

may occur on one side only, its fellow on the opposite side being normal. There are minute differences in the apices of the inner branch of the same appendage, as may be seen from fig. 18.

The 2nd antennae also, it may be noted, are subject to some variation in the proportions of the joints, especially the flagellum, owing to injury when young and consequent rejuvenation. In a long series these points are easily discounted, but single specimens might conceivably lead one astray.

Key to the South African subgenera and species.

- I. Eye composed of several ocelli.
 - A. Head concrete (fig. 16, *l*) *Aphiloscia vilis*.
 - B. Head discrete (fig. 16, *k*).
 - 1. Peduncle of uropod triangularly excised on outer edge (fig. 16, *t*)
 - Philoscia muscorum*.
 - 2. Peduncle of uropod keeled on outer edge (fig. 16, *s*)
 - Komatia marginata*.
 - 3. Peduncle of uropod grooved on outer edge (fig. 16, *v*).
 - a*. Inner plate of maxilliped hirsute (fig. 16, *h*) . . . *Setaphora*.
 - i*. Postero-lateral angles peraeon segments 5-7 subquadrate.
 - a*. Mottled *mina*.
 - β*. Transversely banded *cingulata*.
 - ii*. Postero-lateral angles peraeon segments 5-7 acute
 - demarcata*.
 - b*. Inner plate of maxilliped spinose (fig. 16, *g*) . . . *Nahia hirsuta*.
- II. Eye composed of a single large ocellus *Benthanops fulva*.
- Insertae sedis *Philoscia elongata*.

Subgen. *Philoscia*.

Head discrete, no frontal marginal line. Pleurae shortly produced. Molar penicil with several branches arising from a common stalk (fig. 16, *a*). Apex of inner plate of maxilliped spinose. Peduncle of uropod broad, outer margin with slight triangular depression, the lateral keels bounding this depression meeting near base (fig. 16, *t*); inner ramus inserted almost at same level as outer ramus.

Philoscia (Philoscia) muscorum (Scop.).

(Figs. 16, *a, d, t*; 19, *a*).

- 1763. *Oniscus muscorum*. Scopoli, Entom. Carniolica, p. 415.
- 1898. *Philoscia* ,, Sars, Crust. Norw., ii, p. 173, pl. lxxvi, fig. 1.
- 1906. ,, ,, Webb and Sillem, Brit. Woodlice, p. 29, fig. 44 and pl. x.
- 1920. ,, ,, Collinge, Ann. Nat. Mus., iv, p. 478.
- 1922. ,, ,, Wahrberg, Ark. Zool., xv, p. 8.

Surface with scattered setules dorsally and laterally, posterior margins of segments with a regular series of setules.

Postero-lateral angle of peraeon segment 7 quadrate, reaching to end of pleon segment 3. Pleurae of segments 3-5 shortly produced, visible in dorsal view, the portions projecting beyond the hind margins

being about half the mid-dorsal length of the segments.* Telson triangular.

Peraeopods 1-3 in ♂, 4th and 5th joints with slender, apically entire spines (fig. 19, *a*).

Pleopod 1 in ♂, outer branch apically bluntly rounded, outer margin sinuous.

Uropod, greatest width of peduncle greater than length of outer margin, outer surface triangularly depressed, but not deeply, inner ramus three-quarter length of outer ramus.

8.5 × 3.5 mm. Reddish-brown or fulvous, with lighter patches, mid-dorsal line dark, antennae and legs more or less banded with light and dark, eyes black.

Localities.—Natal: Hilton Road and Mid-Illovo (Collinge).

Distribution.—Europe, North Africa.

This species is the genotype of the genus *Philoscia*.

The above description is taken from English examples; I have seen no South African specimens. It is evidently a casual importation.

Subgen. *Aphiloscia* B-L.

1908. *Aphiloscia*. Budde-Lund in Voeltzkow, Reise, ii, p. 291.

Head concrete, frontal margin more or less distinct. Pleurae pro-

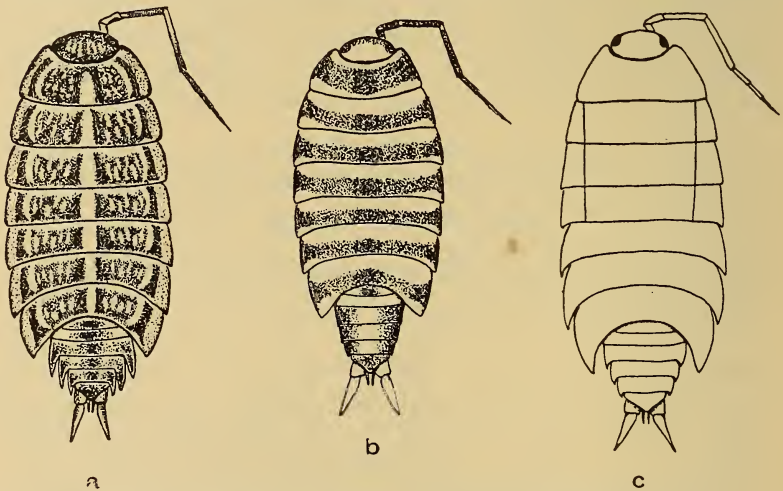


FIG. 17.—*a*, *Philoscia vilis* B-L.; *b*, *Setaphora cingulata* n. sp.; *c*, *Setaphora demaricata* ♀ n. sp.

duced. Molar penicil consisting of a single unbranched seta. Apex of inner plate of maxilliped spinose (fig. 16, *g*). Inner spines on outer

* See fig. 24, *c* for these measurements.

lobe of maxilla 1 bifid. Peduncle of uropod broad, outer edge with triangular depression, with a slight bulge in middle, the lateral keels bounding the depression meeting a short distance from base and continued as a single keel to base (fig. 16, *u*); inner ramus arising proximally to outer ramus.

Philoscia (Aphiloscia) vilis B-L.

(Figs. 16, *g, i, l, m, n, u*; 17, *a*; 18, *d*; 19, *c*.)

1885. *Philoscia vilis*. Budde-Lund, Crust. Isop. Terr., p. 210.
 1908. *Aphiloscia* ,, *Id., loc. cit.*, p. 292.
 1910. ,, ,, Stebbing, Gen. Cat. S. Afr. Crust., p. 443.
 1917. *Philoscia dilectum*. Collinge, Ann. Nat. Mus., iii, p. 597,
 pl. xlii, figs. 21-31.
 1920. ,, ,, *Id., ibid.*, iv, p. 478, pl. xxvii, fig. 8
 (figure shows only 6 peraeon seg-
 ments).

Surface with minute scattered setules, regularly spaced short setules on hind margins of segments (fig. 16, *i*).

Postero-lateral angle of peraeon segment 7 quadrate (*cf.* Sars, 1898, pl. lxxvi, *muscorum*), reaching nearly to end of pleon segment 4 (middle of the segment, not end of pleura). None of the epimera demarcated in ♀. Pleurae of pleon segments 3-5 acutely produced, the projecting portions a little longer than the mid-dorsal length of segments, visible in dorsal view. Telson triangular, apically dorsally impressed.

Flagellum of antenna 2 subequal to 5th joint of peduncle, its joints subequal.

Peraeopods 1-3 in ♂, spines on 4th and 5th joints apically slightly expanded and minutely trifid (fig. 19, *c*).

Pleopod 1 in ♂, outer branch apically blunt, outer margin slightly concave (fig. 16, *n*); apex of inner branch, fig. 18, *d*.

Uropod, greatest width of peduncle at least equal to length of outer margin, outer edge triangularly depressed, inner ramus half length of outer ramus.

11 × 5 mm. Plumbeous or greeny-brown, mottled with lighter, but very variable; epimera usually dark, usually a dark stripe laterally (where the epimera merge into the tergites) with a light stripe externally; median line of peraeon and pleon usually light, flanked with dark; telson dark, often with 2 light dots; 1st-3rd joints and

basal half of 5th joint of antennae orange (whitish in alcohol), the rest grey, 2nd joint of peraeopods suffused with grey ventrally; eyes black.

Localities.—Cape Province: East London (Collinge).

Natal: widely distributed. Pietermaritzburg and other localities (Collinge); Inchanga, Port Shepstone, and Scottburgh (K. H. B.); Howick (W. F. P.).

Zululand: M'fongosi (Collinge and W. E. J.).*

Portuguese East Africa: Masiene (R. F. L.).

Transvaal: Sabie Game Reserve (E. L. G.); Kaapmuiden (R. W. E. T.); Louis Trichardt (R. W. E. T.); Zoutpansberg (R. F. L.).

Rhodesia: Bulawayo (R. W. E. T.).

Ovamboland: Mafa, N. of Ondongua (K. H. B.).

Although the specimen (presumably the type) in the British Museum (*ex coll.* Budde-Lund) is in fragments, comparison with Natal specimens removes all doubt as to the identity of *dilectum* and *vilis*.

The exact locality of the original specimen is unknown; it was collected by the botanist Drege, who travelled widely not only in the Cape but also in Natal (see p. 179).

Komatia subgen. n.

Head concrete, frontal margin distinct. Pleurae produced. Molar penicil consisting of a single unbranched seta. Inner plate of maxilliped spinose. Inner spines on outer lobe of maxilla 1 bifid. Peduncle of uropod broad, outer edge convex, slightly keeled longitudinally (fig. 16, *s*).

Resembling *Aphiloscia* except in the uropod. In this respect there seems to be a resemblance to *Phalaba* B-L., 1910, but in the latter the inner ramus arises far anterior to the outer ramus.

Philoscia (*Komatia*) *marginata* n. sp.

(Figs. 16, *s*; 18, *a*; 19, *d*.)

Surface with minute scattered setules.

Postero-lateral angles of peraeon segment 7 slightly more acute than in *vilis*. Pleurae of pleon segments 3-5 acutely produced, the projecting portions longer than the mid-dorsal length of segments. Telson triangular, apically acute, dorsally impressed.

* A native name, not Mt. [Mount] Fongosi as Collinge writes it.

Flagellum of antenna 2 subequal to 5th joint of peduncle, its 1st joint longest, 2nd slightly shorter, 3rd slightly shorter than 2nd.

Peraeopods 1-3 in ♂, spines on 4th and 5th joints apically trifid (fig. 19, *d*).

Pleopod 1 in ♂, outer ramus as in *vilis*, but apex more acute; apex of inner branch, fig. 18, *a*.

Uropod, greatest width of peduncle equal to length, outer edge convex, with a slight longitudinal keel, outer ramus a little longer than peduncle, stout, outer margin grooved, inner ramus arising almost at same level as outer, stout, $\frac{2}{3}$ length of outer ramus.

11 × 5 mm. Slaty-grey, uniform but slightly irrorated on either

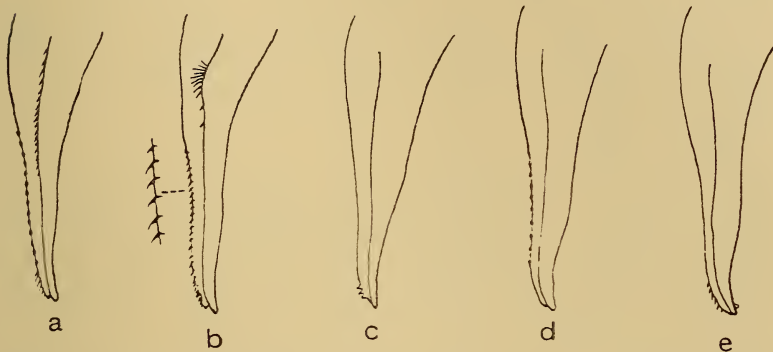


FIG. 18.—Apex of stylet (endopod) of pleopod 1 ♂ of: *a*, *S. demarcata* and *K. marginata*; *b*, *S. mina* and *cingulata*; *c*, *N. hirsuta*; *d*, *A. vilis*; *e*, *B. fulva*.

side of median line, lateral margin of epimeron of segment 2, and postero-lateral corners of epimera of segments 3-7 orange, pleon uniform slaty-grey, uropods orange, 1st-3rd joints and distal half of 5th joint of antennae orange, eyes black.

Locality.—Portuguese East Africa: Wanetsi River (a tributary of the Komati River) (S.A. Mus.).

The South African Museum is indebted to Mr. H. W. Bell-Marley for this interesting species.

Subgen. *Setaphora* B-L.

1908. *Anchiphilosia*. Stebbing, Proc. Zool. Soc. Lond., May, p. 28, and October, p. 555 (part: *karongae*).
 1908. *Setaphora*. Budde-Lund in Voeltzkow, Reise, ii, p. 290.

1912. *Setaphora*. *Id.*, Trans. Linn. Soc. Lond., xv, p. 386 (list of species).

1922. *Anchiphiloscia*. Stebbing, K. Vet. Handl. Goteb., xxv, p. 6.

Head discrete, frontal margin obsolete. Pleurae small, adpressed. Molar penicil consisting of a single unbranched seta (fig. 16, *b*). Apex of inner plate of maxilliped minutely hirsute, with 1 or 2 short plumose setules, but no spines (fig. 16, *h*). Inner spines on outer lobe of maxilla 1 bifid (fig. 16, *e*). Peduncle of uropod longer than broad, outer edge channelled, the bordering keels parallel, not converging basally (fig. 16, *v*); inner ramus arising proximally to outer ramus.

It is a question whether *Anchiphiloscia* Stebb., 26th May 1908, should take precedence over *Setaphora* B-L. Budde-Lund's paper in Voeltzkow, Reise, vol. ii, Heft 4, in which *Setaphora* is fully diagnosed, is quoted by himself as published in 1908, though the cover of Heft 4 bears date 1909, without any month given. Wahrberg quotes the date as 1909.

Budde-Lund (Sjostedts Kilimandjaro Exp., p. 17, 1910) considers the genotype of *Anchiphiloscia*, viz. *karongae*, to be synonymous with *S. suarezi*. On the other hand Stebbing's abstract of 26th May scarcely discloses the differential features of his new genus; and as he accepted the genus *Setaphora* when he revised Budde-Lund's posthumous paper in 1912 (Trans. Linn. Soc., xv, p. 386), while at the same time claiming the priority of his *Paraphiloscia* 1900 over Budde-Lund's *Pseudophiloscia* (*loc. cit.*, 1912, p. 372, footnote), we may allow *Setaphora* to stand.

Moreover, Stebbing in 1922 records his own species *A. karongae* with the second species *cunningtoni* as a synonym, so that evidently he neither regarded his genus as the same as *Setaphora*, nor agreed with Budde-Lund (1910) that *cunningtoni* and *karongae* belonged to two separate subgenera.

The final decision rests on the actual date of Budde-Lund's 1908 paper, and the re-examination of Stebbing's species *karongae*.

Philoscia (Setaphora) mina B-L.

(Figs. 18, *b*; 19, *e*.)

1885. *Philoscia mina*. Budde-Lund, Crust. Isop. Terr., p. 219.

1910. „ „ Stebbing, Gen. Cat. S. Afr. Crust., p. 443.

(Non *mina* Dollfus, 1893. Seychelles.)

Surface sometimes with a few setules laterally, none on hind margins of segments.

Postero-lateral angles of peraeon segment 7 rounded-quadrate (blunter than in *muscorum*), scarcely reaching end of pleon segment 3. Pleurae of segments 3-5 very short, adpressed, not visible in dorsal view, about one-quarter mid-dorsal length of segments. None of the epimera demarcated in ♀. Telson triangular, apex acute in large specimens, but frequently rounded in young examples, slightly impressed dorsally.

Antenna 2 slender, 5th joint longer than 4th, flagellum equal to 5th joint.

Peraeopods 1-3 in ♂, spines on 4th and 5th joints apically bifurcate, each branch apically bifid (fig. 19, e).

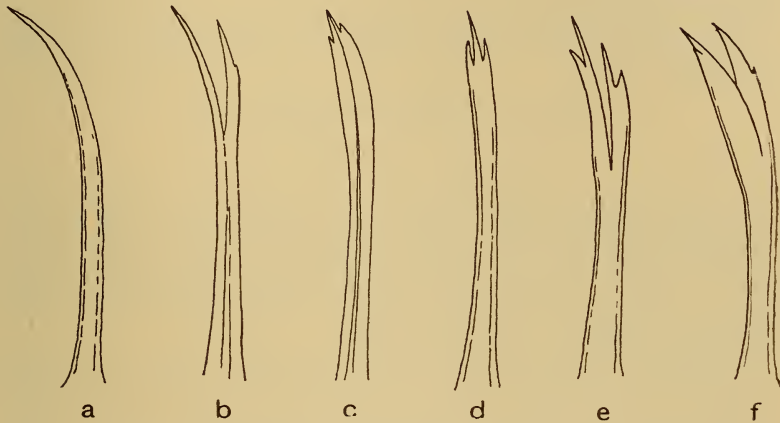


FIG. 19.—Spines from 5th joint of peraeopods 1-3 ♂ of: a, *P. muscorum*; b, *S. cingulata* and *demarcata*; c, *A. vilis*; d, *K. marginata*; e, *S. mina*; f, *N. hirsuta* and *B. fulva*.

Pleopod 1 in ♂, outer branch more definitely incised than in *cingulata*, but less so than in *hirsuta*; apex of inner branch (fig. 18, b).

Uropod, peduncle longer than wide, inner ramus one-half length of outer ramus.

Up to 13 × 5 mm., ovigerous ♀♀ from 8 mm. upwards. Horny-yellowish, more or less suffused with minute grey dendritic specks, which are more or less confluent along the sides, mid-dorsal line, and margins of segments; sometimes almost or quite uniform yellowish; legs pale, sometimes with a few speckles, 1st-3rd joints of antennae orange, rest dark slaty-grey, eyes black.

Localities.—Natal: Howick (W. F. P.); Durban, Inchanga, and Scottburgh (K. H. B.); Port Edward, South Coast (Natal Museum).

Distinguished by the very short pleural points, and the speckly

coloration ; the contrast of colour in the antennae is very striking in life, but often fades in alcoholic material.

The exact position of this species was not defined by Budde-Lund. In 1906 (pp. 71, 90) he grouped *hirsuta* and *mina* from South Africa and *pubescens* from New Zealand together, although in 1904 (p. 43) he had already incorporated *pubescens* in *Pseudophiloscia*. In 1908 (p. 290) *Nahia* is instituted for *hirsuta* "and others," but *mina* is not specifically mentioned.

Budde-Lund's description fits the present specimens, and the colour he gives for the antennae leaves no doubt that they should be referred to his species : "ad basin flavescens, ad apicem nigrescentes ; articulorum basis flava."

The original specimens were collected by Drege either in the Cape or Natal.

Philoscia (Setaphora) cingulata n. sp.

(Figs. 16, *o* ; 17, *b* ; 18, *b* ; 19, *b*.)

Closely resembling *mina*, with which it agrees in the shape of the outer branch of pleopod 1 ♂ (fig. 16, *o*), but differing in the colour pattern. Flagellum of antenna 2 a little longer than 5th peduncular joint. Spines on 4th and 5th joints of peraeopods 1-3 in ♂ deeply bifurcate, the points entire (fig. 19, *b*).

7 × 3 mm. Pale yellowish, with broad greyish bands across front of head between eyes, and across the peraeon and pleon segments, on the latter usually interrupted in the middle line ; antennae pale greyish, legs pale without grey marks ; eyes black.

Localities.—Natal : Port Shepstone (K. H. B., 1912) ; Howick (W. F. P.).

The widely different colour pattern at once separates this form from *mina*. Even in the most strongly suffused examples of the latter species the grey pigment does not form a band across the anterior margin of the 1st peraeon segment.

Philoscia (Setaphora) demarcata n. sp.

(Figs. 16, *q* ; 17, *c* ; 18, *a* ; 19, *b*.)

Surface with scattered setae, becoming longer on epimera and on pleon and telson.

Postero-lateral angles of peraeon segments 5-7, especially 7, acute. Epimera of segments 2-4 in ♀ demarcated. Pleurae of segments 3-5

acutely produced, but not spreading, projecting portions equal to mid-dorsal length of segments. Telson triangular, apex acute.

Peraeopods 1-3 in ♂, spines on 4th and 5th joints as in *cingulata* (fig. 19, b).

Pleopod 1 in ♂, outer branch apex acute, outer distal margin excised, but not as deeply as in *hirsuta* (fig. 16, q); apex of inner branch (fig. 18, a).

Uropod, greatest width of peduncle nearly equal to length, inner ramus half length of outer ramus.

7 × 3 mm. Brownish-fulvous, with lighter and darker mottling.

Locality.—Natal: Pietermaritzburg (K. H. B., 1917).

This species is at once distinguished from all the other South African species of *Philoscia* by the acute postero-lateral angles of peraeon segments 5-7, and in the ♀ by the demarcated epimera on segments 2-4 (cf. Budde-Lund, 1908, pp. 295, 296).

Subgen. *Nahia* B-L.

1908. *Nahia*. Budde-Lund in Voeltzkow, Reise, ii, p. 290.

Head discrete, frontal margin obsolete. Pleurae small, adpressed. Molar penicil consisting of a single unbranched seta. Apex of inner plate of maxilliped spinose. Uropod as in *Setaphora*.

At present this subgenus contains only the one species, as *mina* is more properly included in *Setaphora*, and *pubescens* (New Zealand) has gone into *Paraphiloscia* Stebb., 1900 (*Pseudophiloscia* B-L., 1904).

Philoscia (*Nahia*) *hirsuta* B-L.

(Figs. 16, j, k, p, v; 18, c; 19, f.)

1906. *Philoscia hirsuta*. Budde-Lund, Deutsch. Südpol. Exp., ix, p. 89, pl. iii, figs. 42-52 (figs. 42 and 43 are transposed).
1908. „ „ *Id.*, in Voeltzkow, Reise, ii, p. 290.
1910. *Nahia* „ Stebbing, Gen. Cat. S. Afr. Crust., p. 442.
1917. *Philoscia warreni*. Collinge, Ann. Nat. Mus., iii, p. 578, pl. xlii, figs. 10-20.
1920. „ „ *Id.*, *ibid.*, iv, p. 477, pl. xxvii, fig. 7.
1922. *Anchiphiloscia karongae*. Stebbing, K. Vet. Handl. Goteb., xxv, p. 6 (non *A. karongae* Stebb., 1908).*

* Stebbing here includes *cunningtoni* as a synonym of *karongae* in spite of Budde-Lund's opinion (1910, p. 17) that the two species belong to two separate

Surface with scattered setules, more numerous and longer laterally, and on pleon segments and telson, hind margins of segments not setulose (fig. 16, *j*).

Postero-lateral angles of peraeon segment 7 quadrate, reaching to about end of pleon segment 4. None of the epimera demarcated in ♀. Pleurae of segments 3-5 very shortly produced, adpressed, scarcely visible in dorsal view, the projecting portions less than half the mid-dorsal length of segments. Telson triangular, dorsally not impressed.

Flagellum of antenna 2 a little longer than 5th joint, its joints subequal or the 1st a little longer than either 2nd or 3rd.

Peraeopods 1-3 in ♂, spines on 4th and 5th joints deeply bifurcate, each branch with a subterminal denticle (fig. 19, *f*).

Pleopod 1 in ♂, outer branch apically acute, outer margin distally excised (fig. 16, *p*); apex of inner branch (fig. 18, *c*).

Uropod, peduncle longer than wide, inner ramus half length of outer.

11 × 5 mm. (Collinge says 14 mm.); ovigerous ♀♀ from 7 mm. upwards. Slaty-grey, mottled and irrorated with lighter, basal joints of antennae always grey, though the basal part of each segment of the peduncle may be pale, legs and uropods more or less suffused, as may be also the outer branches of pleopods 3-5, and sometimes the penis, eyes black.

Localities.—Cape Province: Cape Peninsula and Cape Flats (Budde-Lund and K. H. B.); Houw Hoek (K. H. B.); Fransche Kraal, Gans Bay (Stebbing); Bredasdorp (R. F. L.); Swellendam (K. H. B.); Mossel Bay (W. F. P.); Forebay, near Mossel Bay (K. H. B.); Pocaltsdorp (W. F. P.); Wilderness, near George (S. H. H. and C. T.); Knysna (R. F. L.); Keurbooms River (K. H. B.); Addo Bush (J. D.); Port Alfred; Alice (S. H. H.); East London (Collinge); Katberg (Albany Mus.); Grahamstown (Albany Mus.).

Natal: Durban and other localities (Collinge); Inchanga, Pietermaritzburg, and Krantzkop (K. H. B., 1917).

Zululand: M'fongosi (Collinge and W. E. J.).

subgenera: *karongae* to *Setaphora*, being very likely a synonym of *S. suarezi*, and *cunningtoni* to *Aphiloscia*, being possibly a synonym of *A. maculicornis*. See *supra*, p. 242.

Collinge does not describe the 1st pleopod in ♂, but from an examination of my Natal specimens there can be no doubt that *warreni* is a synonym. From the coastal distribution of this species it seems highly probable that Stebbing's specimens from Gans Bay should be referred here.

From the material at hand it appears that ovigerous ♀♀ are found in the Cape from October to March, and in Natal from November to January. I have seen no specimens as large as 14 mm. (unless the uropods be included in this measurement), but the Natal specimens tend to be larger than those from the Cape.

The species is found among dead leaves and humus, and occurs on the margins of salt or brackish vleis (Noordhoek and Zeekoe Vleis, Cape Peninsula, K. H. B.) or estuaries (Keurbooms River, K. H. B.). It does not occur on the upper slopes or top of the Cape Peninsula mountains.

Benthanops subgen. n.

Head discrete, frontal margin obsolete. Pleurae small, adpressed. Molar penicil consisting of a tuft of plumose setae, each arising separately (fig. 16, *c*) (as in *Balloniscus*, Budde-Lund, 1908, p. 289, pl. xvi, fig. 3), not joined together in a common stem as in *P. muscorum*. Apex of inner plate of maxilliped with one spine. Inner 5 spines on outer lobe of maxilla 1 strongly serrate (fig. 16, *f*); the 2 plumose setae on inner lobe elongate. Peduncle of uropod with outer edge channelled. Eye consisting of a single large ocellus.

This subgenus is very close to *Benthana* B-L., 1908, which comprises 4 species from Brazil, Chile, and Peru (Jackson, Proc. Zool. Soc. Lond., 1926, p. 193 *sqq.*), and is characterised by the serrate spines on outer lobe of 1st maxilla. In the subgenus *Benthana* Jackson included also *minima* Dollfus from the Iberian Peninsula. This last species agrees with the typical species of *Benthana*, but has the eyes simple, *i.e.* each eye consists of only a single ocellus. Whether *minima* should be separated on this account is perhaps an open question.

The form here included in a new subgenus agrees with *minima* in the simple eyes, and is separated from the typical species of *Benthana* in the molar penicil; and also the 2nd maxilla which has no apical cleft.

Philoscia (*Benthanops*) *fulva* n. sp.

(Figs. 16, *c, f, r*; 18, *e*; 19, *f*; 20.)

Surface with scattered setules, more noticeable in the young, regularly spaced setules on hind margins of segments.

Postero-lateral angles of segment 7 quadrate. None of the epimera demarcated in ♀. Pleurae of segments 3–5 shortly produced, just visible in dorsal view, projecting portions not more than half mid-dorsal length of segments. Telson broader than long, margins feebly concave, apex narrowly rounded or subacute.

Antenna 2 reaching to middle of 4th peraeon segment, slender, 5th joint equal to 3rd plus 4th, flagellum subequal to 5th, 1st joint longest, 2nd and 3rd subequal.

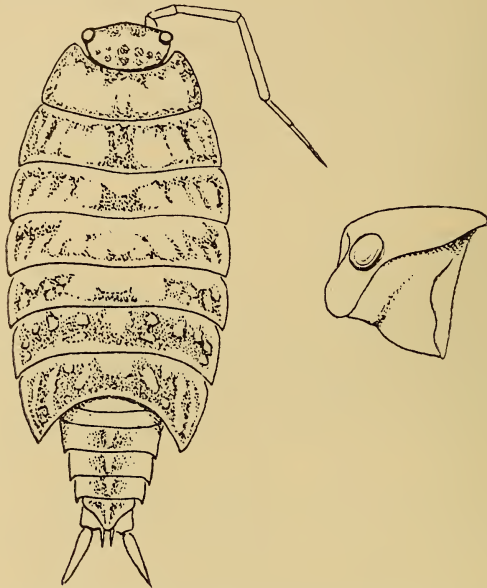


FIG. 20.—*Philoscia* (*Benthanops* subgen. n.) *fulva* n. sp.
Whole animal with lateral view of head.

Maxilla 1, outer plate with 4 + 5 spines, inner spines with fine and close serrations on inner margins.

Maxilliped as in *Benthana* (Jackson, *loc. cit.*, 1926, figs. 136, 147, 159), but with only a small spine on inner plate.

Peraeopods 1–3 in ♂, spines on 4th and 5th joints deeply bifurcate as in *hirsuta* (fig. 19, *f*).

Pleopod 1 in ♂, outer branch apex blunt, outer margin slightly concave (fig. 16, *r*); apex of inner branch (fig. 18, *e*).

Uropod, peduncle with outer edge grooved, outer ramus twice length of peduncle, inner ramus arising from almost same level as outer ramus, about one-third length of outer ramus.

Up to 7 × 2.5 mm. Yellowish-horny, very faintly marbled with

darker fulvous brown, eyes glistening brown. In some specimens there are well-marked dark brown markings on a whitish or yellowish ground colour, eyes dark brown.

Localities.—Cape Province: Table Mt. and other mountains in the Cape Peninsula (K. H. B.); Palmiet River Mts., near Kleinmond (K. H. B.); Zwartberg, Caledon (K. H. B.).

The dark specimens are very much rarer than the ordinary yellowish form, from which they cannot be distinguished morphologically, and appear to be merely melanistic aberrations.

The species occurs under stones and among humus in the bushy or wooded ravines of the mountains; it does not occur at low levels.

Philoscia elongata Dollf.

1879. *Philoscia pulchella*. Budde-Lund, Prosp. Crust. Isop. Terr., p. 2 (*sine descr.*).
 1884. „ *elongata*. Dollfus, Bull. Soc. Étud. Sc. Paris, 7me An.
 1885. „ *pulchella*. Budde-Lund, Crust. Isop. Terr., p. 214.
 1892. „ *elongata*. Dollfus, Ann. Soc. Esp. d’Hist. Nat., xxi, p. 186.
 1895. „ „ *Id.*, Mem. Soc. Zool. Fr., viii, p. 350.
 1896. „ „ *Id.*, Wiss. Mitt. Bosn. Herzog, iv, p. 586.
 1914. „ *pulchella*. Arcangeli, Atti Soc. It. Sc. Nat. Milan, lii, p. 479.
 1923. „ *elongata*. *Id.*, Bol. Mus. Zool. Anat. Torino, xxxviii, n.s., No. 3, pp. 1–7, pl. i.*
 1924. „ „ *Id.*, Trabaj. Mus. Cienc. Nat. Barcelona, iv, No. 12, p. 24.
 1925. „ „ *Id.*, Abh. Senckenb. Ges., xxxix, p. 136.
 1926. „ „ *Id.*, Senckenbergiana, viii, p. 268.
 1926. „ „ *Id.*, Atti Mus. Civ. St. Nat. Trieste, xi, p. 42.

This Mediterranean (South Europe and North Africa) species was recorded from Cape Town by Dollfus (1895).

* In vol. xxxviii, 1923, papers 1–3 are numbered vol. “xxviii,” which is evidently a *laps. typ.*, as papers 4–14 are correctly numbered as belonging to vol. xxxviii. Arcangeli in 1926 (Trieste), p. 58, quotes the number “xxviii” in his bibliography.

The original description is inaccessible to me, and Budde-Lund's 1885 description is insufficient to place the species in any definite subgenus (as is probably also the original description).

One of the characters which separates it from *muscorum* and all the South African species is the length of pleon segments 1 and 2, which are scarcely shorter than the other pleon segments (Budde-Lund, 1885, and Arcangeli, 1923, pl. i, fig. 5); in fact Arcangeli's figure shows the first segment (σ) as twice the length of any of the others. The pleurae of segments 3-5 are very small, adpressed. Sides of telson straight. Peduncle of uropod externally sulcate (Budde-Lund).

Arcangeli (1923) describes and figures a modification in the 1st peraeopod and the *fifth* pleopod of the σ , which he suggests may be assumed only at the period of copulation; and he expresses a warning against using these modifications as specific characters.

The 5th joint of peraeopod 1 is ovately expanded, almost sub-circular, in the left peraeopod, but less expanded in the right; the 6th joint also is somewhat more lanceolate in the left than in the right. A similar but less marked modification occurs in the 2nd peraeopod. The figure shows a few large spines on the inner margin of the 4th and 5th joints, not the thick brush of spines which is usual in the σ . Expansion of the 5th joint of peraeopod 1 in σ occurs also in *variegata* Dollf. (see van Name, Amer. Mus. Novitat., No. 206, p. 11, figs. 19, 20, 1926; and Arcangeli, Boll. Lab. Zool. Gen. Portici, xxv, p. 18, fig. v, 4, 1930), and according to van Name in *muscorum*; in the latter species I have not found any expansion in English examples.

The most remarkable modification is the extreme extension of the outer ramus of the 5th pleopod into a long slender process, which is channelled on its inner margin, and protrudes far beyond the telsonic apex, and even beyond the apices of the uropods.

Arcangeli (1925, Monit. Zool. Ital., xxxvi, p. 105) has recorded a local race of this species, which exhibits protandrous hermaphroditism and also parthenogenesis. As in *Rhyscotus* (see p. 287, *infra*) the males retain the external genitalia during the female phase. Normal females exist alongside the hermaphrodites. The latter only function as males during or at the end of their first year of life; they fertilise the genuine females of the same age. The following year the testes degenerate and the ovaries mature. It seems that the young males cannot fertilise the older and larger genuine females, and the evidence goes to show that the latter are parthenogenetic. The fertilised eggs of the young females develop into protandrous hermaphrodites,

while the large females produce genuine females parthenogenetically (summary from Jackson, Quart. Journ. Microsc. Sci., lxxi, 1928).

Gen. PORCELLIO Latr.

1804. *Porcellio*. Latreille, Hist. Nat. Crust. Inst., vii, p. 45.
 1885. ,, Budde-Lund, Crust. Isop. Terr., p. 82.
 1898. ,, Sars, Crust. Norw., ii, p. 176.
 1907. ,, Verhoeff, SB. Ges. Naturf. Fr. Berlin, p. 229
 (subgenera).
 1908. ,, Budde-Lund in Voeltzkow, Reise, ii, p. 280
 (subgenera).

Body smooth, granulate, or tuberculate. Head discrete, lateral lobes well developed, frontal lobe usually projecting. Pleon not much narrower than peraeon, pleurae well developed. Telson apically produced.

Antenna 2, flagellum 2-jointed, the two joints subequal. Mandible with several penicils between the secondary cutting plate and the molar penicil, which consists of a tuft of plumose setae.* Peraeopods 1-3 and sometimes also 7 sexually dimorphic. Outer branches of pleopods 1 and 2, or 1-5, with pseudotracheae. Peduncle of uropod externally grooved or excised, outer ramus often larger in ♂ than in ♀.

This large genus has been subdivided into a number of subgenera. Budde-Lund (1908) lists 21 subgenera, divided into two groups according to the spines on outer lobe of maxilla 1, but not otherwise defined except by their respective genotypes. Verhoeff, however, had previously subdivided the genus, and irrespective of the character selected by Budde-Lund for his two major groups. Verhoeff, *e.g.*, places *hoffmanseggii*, *rathkei*, *scaber*, and *obsoletus*, inter alia, in his *Euporcellio*, whereas Budde-Lund makes each of these species the type of a subgenus. Verhoeff indicates no genotypes, but places *laevis* as the first species of his *Mesoporcellio*. This latter name therefore may be definitely regarded as coinciding with and antedating Budde-Lund's *Gymnoderma*, genotype *laevis*.

The sexual difference in the 7th peraeopod is in the shape and size of certain of the joints; in the 1st-3rd peraeopods it lies in the increased number of spines on the anterior and lower surfaces of the

* Sars' figure (1898 pl. lxxvii) is not quite correct. The molar penicil consists of several plumose setae each arising separately, as I have checked by examination of Norwegian and other examples of *scaber*.

4th and 5th joints and the minute structure of these spines (*cf.* Wahrberg, 1922).

The armature of spines on the anterior peraeopods in the ♂ is regarded by Verhoeff as a cleansing apparatus (Putzapparat) and the term is accepted by Wahrberg (1922, pp. 94, 153). The term seems to be incorrect, for it is not clear why the ♂ requires to be cleaner than the ♀, or requires a stronger brush of spines to effect the same purpose as the comparatively few spines in the ♀. It seems, on the other hand, clear that this brush of spines on the anterior peraeopods of the ♂ is for the purpose of securing a grip on the ♀ during copulation, and Verhoeff would have been more correct in using the term "Haftapparat."

Porcellio (Porcellio) scaber Latr.

(Fig. 21, a-c.)

- | | | |
|-------|--------------------------|--|
| 1804. | <i>Porcellio scaber.</i> | Latreille, <i>loc. cit.</i> , p. 45. |
| 1885. | " " | Budde-Lund, <i>loc. cit.</i> , p. 129. |
| 1895. | " " | Dollfus, Mem. Soc. Zool. Fr., viii, p. 349. |
| 1898. | " " | Sars, <i>loc. cit.</i> , p. 176, pl. lxxvii. |
| 1906. | " " | Webb and Sillem, Brit. Woodlice, p. 32,
fig. 47 and pl. xiii. |
| 1906. | " " | Budde-Lund, Deutsch. Südpol. Exp., ix,
p. 88. |
| 1909. | " " | <i>Id.</i> , in Schultze, Reise, ii, p. 58. |
| 1910. | " " | Stebbing, Gen. Cat. S. Afr. Crust., p. 440. |
| 1922. | " " | Wahrberg, Ark. Zool., xv, p. 4, fig. 1. |

Surface with transverse rows of rounded tubercles on head and peraeon segments, and on posterior margins of pleon segments. Frontal and lateral lobes on head equally prominent. Telson as long as broad, apex acute, dorsally slightly grooved.

Flagellum of antenna 2 subequal to 5th peduncular joint, its two joints subequal. Four of the inner spines on outer lobe of maxilla 1 bifid. Peraeopod 7 not differing in the two sexes. Peraeopods 1-4 in ♂ with thick brush of spines (fig. 21, c). Dactylar seta on all peraeopods simple, acute. Pseudotracheae on pleopods 1 and 2.

Up to 16 × 7.5 mm. Slaty-grey, uniform or variously mottled.

Localities.—Cape Province: Cape Town (Dollfus and S.A. Mus.); Cape Flats (Budde-Lund).

Distribution.—Cosmopolitan. It occurs on the islands of St. Paul and New Amsterdam (Indian Ocean), and St. Helena (Budde-Lund). The South African Museum has examples from Tristan d'Acunha.

In and around Cape Town this species seems to be far less common than *laevis*.

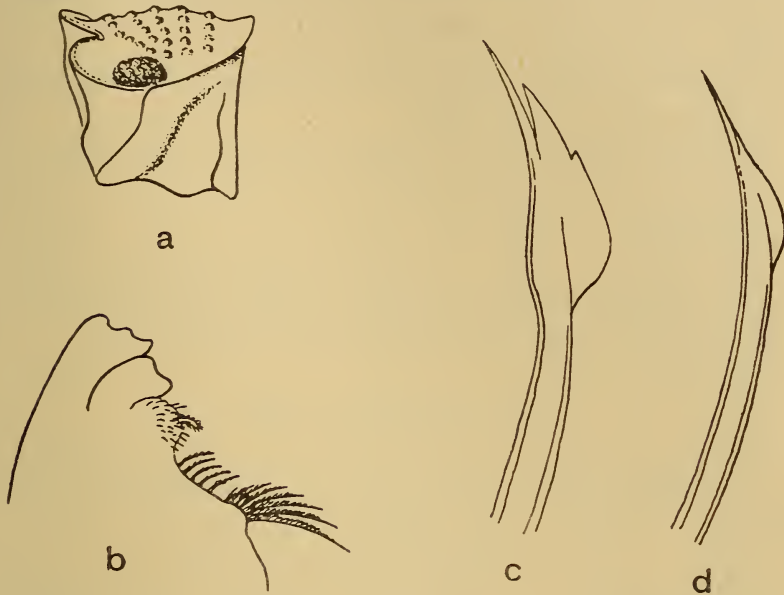


FIG. 21.—*Porcellio*. a, b, lateral view of head, and apex of mandible of *scaber*; c, d, spines from pereopod 1 ♂ of *scaber* and *laevis* respectively.

Porcellio (Mesoporcellio) laevis Latr.

(Fig. 21, d.)

1804. *Porcellio laevis*. Latreille, *loc. cit.*, p. 46.
 1885. " " Budde-Lund, *loc. cit.*, p. 138.
 1898. " " Sars, *loc. cit.*, p. 181, pl. lxxix, fig. 2
 (synonyms).
 1906. " " Webb and Sillem, Brit. Woodlice, p. 35,
 fig. 51 and pl. xvii.
 1906. " " Budde-Lund, Deutsch. Südpol. Exp., ix,
 p. 88.
 1922. " " Wahrberg, Ark. Zool., xv, p. 182, figs. 9, 58.

Surface smooth or very feebly tuberculate, chiefly on posterior margins of pleon segments. Frontal lobe not quite so prominent as the lateral lobes. Telson broader than long, apex acute, dorsally grooved.

Flagellum of antenna 2 less than 5th peduncular joint, its 1st joint

slightly longer than 2nd. All spines on outer lobe of maxilla 1 entire. Peraeopods 1-4 in ♂ with thick brush of spines (fig. 21, *d*). Peraeopod 7 not sexually different. Dactylar seta on all peraeopods simple, acute. Pseudotracheae on pleopods 1 and 2.

Up to 20 × 10 mm. Slaty-grey, with a few faint lighter markings on either side of the median line.

Localities.—Cape Province: Cape Town and environs (R. M. L., K. H. B.); Somerset West (A. J. H.).

Distribution.—Cosmopolitan. Has been recorded from St. Helena (Budde-Lund).

This species is very common in gardens in Cape Town and suburbs, and in many areas seems to have almost entirely superseded *scaber*; but apparently has not spread further than to Somerset West.

Gen. PORCELLIONIDES Miers.

- | | | |
|-------|-------------------------|--|
| 1877. | <i>Porcellionides</i> . | Miers, Proc. Zool. Soc. Lond., pp. 668, 676. |
| 1879. | <i>Metoponorthus</i> . | Budde-Lund, Prosp. Crust. Isop. Terr., p. 4. |
| 1885. | „ | <i>Id.</i> , Crust. Isop. Terr., pp. 76, 161. |
| 1898. | „ | Sars, Crust. Norw., ii, p. 183. |
| 1908. | „ | Budde-Lund in Voeltzkow, Reise, ii, p. 285. |
| 1911. | <i>Porcellionides</i> . | Stebbing, Rec. Ind. Mus., vi, p. 188. |
| 1928. | „ | Jackson, Proc. Zool. Soc. Lond., 1928, i, p. 584 (morphology of head). |

Body smooth or granulate. Integument thin, not strongly chitinised or calcified. Head discrete, lateral lobes small and frontal lobe obsolete, frontal line continued round the lateral lobes and meeting the marginal line below the eye. Pleon abruptly narrower than peraeon, pleurae moderate or small. Telson triangular, not produced.

Antenna 2 flagellum 2-jointed, 1st joint slightly longer than 2nd. Mandible with several penicils between secondary cutting plate and the molar penicil, which consists of a tuft of plumose setae, with or without a short common stem. Peraeopods 1-3 in ♂ more strongly spinose than in ♀. Outer branches of pleopods 1 and 2, sometimes also 3, sometimes 1-5, with pseudotracheae. Peduncle of uropod externally grooved or excised.

Stebbing gives the reasons why *Porcellionides* must displace *Metoponorthus*.

The genus is represented in South Africa only by an imported cosmopolitan species.

Porcellionides pruinosus (Brdt.).

(Fig. 22.)

1833. *Porcellio pruinosus*. Brandt, Consp. Onisc., pp. 181 (19),
188 (26).
1885. *Metoponorthus* ,, Budde-Lund, Crust. Isop. Terr., p. 169.
1895. ,, ,, Dollfus, Mem. Soc. Zool. Fr., viii,
p. 350.
1898. ,, ,, Sars, Crust. Norw., ii, p. 184, pl. lxxx,
fig. 2.
1906. ,, ,, Webb and Sillem, Brit. Woodlice, p. 37,
fig. 53 and pl. xix.
1909. ,, ,, Budde-Lund in Schultzze, Reise, ii, p. 58.
1909. ,, ,, *Id.*, Res. Swed. Zool. Exp. White Nile,
iii, Terr. Isop., p. 4.
1910. ,, ,, Stebbing, Gen. Cat. S. Afr. Crust., p. 440.
1911. *Porcellionides* ,, *Id.*, Rec. Ind. Mus., vi, p. 189.
1920. ,, ,, Collinge, Ann. Nat. Mus., iv, p. 479,
pl. xxix, figs. 39-47.
1922. ,, ,, Richardson, Voy. Rothschild Ethiop.,
i, p. 33.
1922. *Metoponorthus* ,, Wahrberg, Ark. Zool., xv, pp. 6, 27,
148, figs. 2, 8, 9, 51.
1924. ,, ,, Panning, Beitr. Kennt. Land. Süßwas-
serf. S.W. Afr., ii, p. 176.
1931. ,, ,, Brian, Rev. Suisse Zool., xxxviii,
p. 439, figs. 32-38 (var. *africana*).

Surface smooth. Faint indications of transverse series of granules or very low tubercles on head and peraeon segments. Epistome with a V-shaped raised line (in Jackson's terminology, 1928, this V separates the postfrons from the profrons).

Antenna 2, 1st joint of flagellum slightly longer than 2nd.

Peraeopods, distal margin of 3rd joint, distal and inner margins of 4th and 5th joints, with close-set short stout spines in all peraeopods in ♀; in the ♂ this marginal armature is absent on the inner margins of 4th and 5th joints in peraeopods 1-3, which carry instead a thick patch of spines.

Pleopod 1 in ♂, apex of inner branch with a few setules, a row of minute granules along inner margin.

Up to 11 × 5 mm. Slaty-grey, faintly mottled, margins of peraeon

and pleon segments sometimes pale, legs and antennae greyish with white markings. The blue-grey colour of live specimens is due to a bloom which is easily rubbed off; preserved specimens fade to a reddish-brown colour.

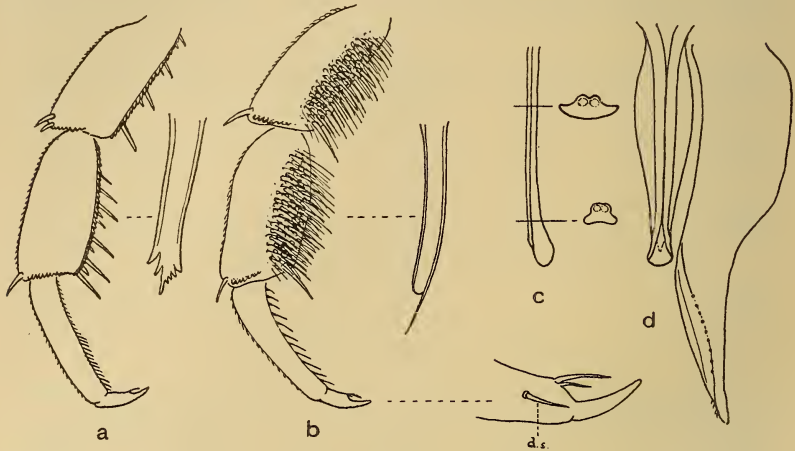


FIG. 22.—*Porcellionides pruinosus* (Brdt.). *a, b*, Distal joints of peraeopod 1 ♀ and ♂ respectively, with spines and dactylar seta (d.s.) further enlarged; *c*, profile view of penis, ventral surface to left; *d*, penis and stylet of pleopod 1 ♂, dorsal view, with cross-section of penis across middle and near apex (in the cross-sections the dorsal surface is uppermost, and the vasa deferentia are represented by dotted circles).

Localities.—Cape Province: Cape Town (Dollfus, W. F. P., and K. H. B.); Cape Flats (Budde-Lund); French Hoek (W. F. P.); Clanwilliam (R. M. L.); Zak River (S.A. Mus.); Steinkopf (Budde-Lund); Bowiesdorp (K. H. B.); Graaf Reinet and Beaufort West (S. H. H.); Lovedale (S. H. H.); Avontuur (W. F. P.); Port Elizabeth (S.A. Mus.); Port St. Johns (S.A. Mus.); Grahamstown (S.A. Mus. and Albany Mus.); Fort Brown (Albany Mus.); Swellendam and Riversdale (K. H. B.); Kimberley (J. H. Power); Richmond (C. T. and L. D. B.).

Natal: Pietermaritzburg (Collinge and K. H. B.); Durban (Collinge and K. H. B.); M'fongosi, Zululand (S.A. Mus.).

Portuguese East Africa: Masiene (R. F. L.).

Transvaal: Hebron and Hammans Kraal (Dollfus); Sabie Game Reserve (E. L. G.); Johannesburg (S.A. Mus.).

Rhodesia: Bulawayo and Salisbury (R. W. E. T.).

Damaraland: Swakopmund, Neudamm, Windkoek, Okahandja, Omaruru (Panning); Outjo (R. F. L. and A. J. H.); Otjituo (R. W. E. T.).

Angola: Vila da Ponte, Kubango R. (Brian).

Distribution.—Cosmopolitan.

This species is only found in the neighbourhood of human habitations.

The differences noted by Collinge are not constant, even in Natal examples, and cannot be used to characterise a local race. I have compared South African specimens with specimens from Norway (*ex* G. O. Sars) and South England. For example, the spines on outer lobe of maxilla 1 are bifid in European specimens, and the outer apex of inner lobe of maxilla 1 is acutely pointed in South African specimens. The inner branch of pleopod 1 in ♂ corresponds exactly with that of European examples.

Gen. NIAMBIA B-L.

1904. *Niambia*. Budde-Lund, Rev. Crust. Isop. Terr., p. 37.
1908. ,, *Id.*, in Voeltzkow, Reise, ii, p. 280 (also p. 295, epimeral sutures).
1909, ,, *Id.*, in Schultze, Reise, ii, p. 59.
1910. ,, *Id.*, Sjöstedt, Kilimandjaro-Meru Exp., iii, 21, pp. 8, 9, 10.
1924. *Thomsenia*. Panning, Beitr. Kennt. Land. Süßwasserf. S.W. Afr., vol. ii, p. 173.

Surface more or less densely covered with setae or scale-spines, which are usually clavate or battledore-shaped, most numerous laterally and on margins of segments and on telson.

Head discrete. Eyes small or moderate, ocelli less than 20.

Epimeral sutures present on segments 2-4 in ♀. Pleurae of pleon segments 3-5 well developed. Telson short, triangular, apex more or less acute, dorsally impressed.

Antenna 2 short, flagellum 2-jointed, 2nd joint 2-3 times as long as 1st. Mandible with single free penicil, molar penicil consisting of several setae on a very short stem (*i.e.* a single branched seta). Maxilla 1, outer lobe with the 4 inner spines either apically bifid, usually feebly so, or simple (*Niambia* s.s.), or strongly serrate (subgen. *Manibia*), inner lobe with 2 unequal plumose setae. Maxilliped, inner plate with 1 spine, and 2 denticles on outer distal corner.

Peraeopods 1-3 in ♂ with thick brush of strong spines on lower and anterior surfaces of 4th and 5th joints. Dactylar seta in all peraeopods apically acute. Peraeopod 7 not dimorphic.

Outer branches of all pleopods with rudimentary pseudotracheae.

Uropod, peduncle short, externally evenly convex, *i.e.* elliptical in cross-section, outer ramus stout.

There appears to me to be considerable doubt as to the validity of *Thomsonia*, even if it be admitted only as a subgenus. Some of the characters relied upon by Panning as differential are, however, common to *Niambia*, *e.g.* the maxilliped and inner lobe of maxilla 1. The inner spines of the outer lobe of maxilla 1 are often so feebly bifid, some of them actually entire, in typical *Niambia*, that this character is valueless even for specific purposes. The very slender spine (No. 4) which leans up against the 3 strong outer spines, as shown in Panning's figure, I have not found in any of the numerous examples of *Niambia* examined, including several specimens of *griseo-flavus*, a species which I believe may be identical with Panning's species (see p. 264). As for the recurved integumentary spinules, they are in lateral view indistinguishable from the ordinary squamose spines which cover the surface in all species of *Niambia*. In view of these doubts *Thomsonia* cannot be accepted otherwise than as a subgenus. Even the one character which might be used to separate a subgenus, *viz.* the shortness of the outer ramus of the uropod, is ruled out by *flavescens* where the peduncle and outer ramus are subequal in length, thus forming a transition.

The genus has hitherto been known only from the south-western portions (Port Elizabeth westwards) of South Africa, and northwards to the Congo, and possibly Senegal. In 1906 (p. 89) Budde-Lund said he knew of two undescribed species from the Cape and Natal, but in 1909 he described no species from Natal, unless he regarded Port Elizabeth (*hirsuta*) as being in Natal. Collinge (1917, p. 568) mentions having specimens of this genus, with a (?), in the collection in his hands, but likewise did not describe any species from Natal. There are none in the South African Museum collection collected by Dr. Purcell; nor did I find any myself in that region. It is interesting therefore to find that there are two species from Portuguese East Africa and Rhodesia which are very closely related to the typical *Niambia*, but for which I consider it advisable to institute a new subgenus (see fig. 39).

Key to the South African species.

- I. Inner spines of outer lobe of maxilla 1 more or less bifid, sometimes very feebly so, or even entire (fig. 24, a) Subg. *Niambia*.
- A. Antenna 2, 4th joint subequal to, or very slightly longer than 3rd.
1. Pleura of segment 5 extending to or nearly to, or a little beyond, telsonic apex.
- a. Outer ramus of uropod longer than peduncle.
- i. Rather strongly granulate. Apex of outer branch of pleopod 1 ♂ acute *squamata* (Congo).
- ii. Feebly granulate. Apex of outer branch of pleopod 1 ♂ excised, bifid *truncata*.
- b. Outer ramus of uropod equal to peduncle. Apex of outer branch of pleopod 1 blunt *flavescens*.
- c. Outer ramus of uropod shorter than peduncle. Apex of outer branch of pleopod 1 blunt *damarensis, griseo-flavus*.
2. Pleura of segment 5 not nearly reaching telsonic apex.
- a. Ocelli 9 *pallida*.
- b. Ocelli 14 *modesta*.
- B. Antenna 2, 4th joint distinctly longer than 3rd.
1. Outer branch of pleopod 1 cordiform. Telson much shorter than broad.
- a. Narrow. Outer branch of pleopod 1 ♂ with sinuous outer margin, without projection *angusta*.
- b. Broader. Outer branch of pleopod 1 ♂ with a projection on outer margin.
- i. Ocelli 12-16. Antenna 2 reaching end of pereaeon segment 2 *capensis*.
- ii. Ocelli 8-9. Antenna 2 reaching end of pereaeon segment 1 *formicarum*.
2. Outer branch of pleopod 1 longer than broad, subtriangular, outer margin deeply excised. Telson nearly as long as broad *longicauda*.
- II. Inner spines of outer lobe of maxilla 1 strongly serrate (fig. 24, b) subg. *Manibia*.
- A. Broad. Ocelli 10 *lata*.
- B. Narrower. Ocelli 6 *microps*.

Niambia squamata (B-L).

(Fig. 23, i.)

1885. *Leptotrichus squamatus*. Budde-Lund, Crust. Isop. Terr., p. 196.
1904. *Niambia squamata*. *Id.*, Rev. Crust. Isop. Terr., p. 37.
1909. " " *Id.*, Schultze, Reise, ii, p. 60, pl. vi, figs. 1-3.
1910. " " Stebbing, Gen. Cat. S. Afr. Crust., p. 441.
1920. " " van Name, Bull. Amer. Mus. Nat. Hist., xliii, p. 102, figs. 122-126.

(? *Non* Panning, 1924, see *modesta*, infra.)

Surface minutely but rather strongly granulate.

Eyes small, ocelli 16 (Budde-Lund), "few" (van Name).

Projecting portions of the pleurae (as indicated on fig. 24) twice, or nearly twice, mid-dorsal length of segments, those of segment 5 extending almost to level of telsonic apex. Telson with sides concave, apex acute, dorsally impressed.

Antenna 2 a little longer than one-third body length (Budde-Lund), reaching to middle of 1st pereopod segment (van Name's figures), 3rd and 4th joints subequal.

Pleopod 1, outer branch about as broad as long, or rather broader, in ♂ cordiform, apex acute, outer margin slightly sinuous (Budde-Lund and van Name); in ♀ proportionately broader, outer margin concave near apex (van Name).

Uropod, outer ramus longer than peduncle.

7.5 × 4.5 mm. Slaty-grey, with paler markings laterally.

Localities.—Landana and Chinchoxo, Portuguese Congo (Budde-Lund); Benin (Budde-Lund MSS.); (?) Senegal (Dollfus); Zambi, Congo mouth, Belgian Congo (van Name).

This species is not South African, but is included to make the account of the genus complete. Panning was himself not certain of the identity of his specimens with *squamata*, and it seems far more likely that they should be referred to one of the truly South African species.

Niambia truncata (Brdt.).

(Fig. 23, a, b.)

- | | | |
|-------|--|---|
| 1833. | <i>Porcellio truncatus</i> . | Brandt, Consp. Oniscid., pp. 19, 28. |
| 1885. | <i>Leptotrichus</i> ,, | Budde-Lund, Crust. Isop. Terr., p. 195. |
| 1904. | <i>Niambia truncata</i> . | <i>Id.</i> , Rev. Crust. Isop. Terr., p. 37. |
| 1906. | ,, ,, | <i>Id.</i> , Deutsch. Südpol. Exp., ix, p. 89. |
| 1909. | ,, ,, | <i>Id.</i> , in Schultze, Reise, ii, p. 60, pl. vi, figs. 4-14. |
| 1909. | ,, <i>brunnea</i> . | <i>Id.</i> , <i>ibid.</i> , p. 61, pl. vi, figs. 15-25. |
| 1909. | ,, <i>hirsuta</i> . | <i>Id.</i> , <i>ibid.</i> , p. 62, pl. vi, figs. 29-31. |
| 1910. | ,, <i>truncata, brunnea, hirsuta</i> . | Stebbing, Gen. Cat. S. Afr. Crust., pp. 441, 442. |
| 1924. | ,, ,, | Panning, Beitr. Kennt. Land. Süßwasserf. S.W.A., ii, p. 193. |

Surface with faint indications of granules.

Eyes with 12-16 ocelli (Budde-Lund: *truncata* 10, *brunnea* 16).

Projecting portions of pleurae $1\frac{1}{2}$ -2 times longer than mid-dorsal length of segments; of 5 extending nearly to level of telsonic apex.

Telson, sides concave, apex acute, slightly impressed dorsally.

Antenna 2 reaching to, or a little beyond, end of peraeon segment 1, 4th joint a little longer than 3rd.

Peraeopods 1-3 in ♂ strongly fringed on lower and anterior surfaces with spines, most of which are apically bifid, some multifid; in ♀ the spines are less numerous, and all are of the latter type.

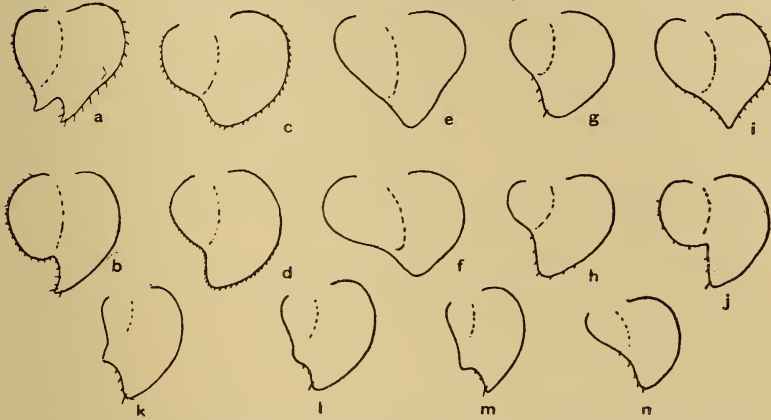


FIG. 23.—*Niambia*. Outer ramus of pleopod 1 of: a, b, *truncata* ♂ and ♀; c, d, *flavescens* ♂ and ♀; e, f, *griseo-flavus* ♂ and ♀; g, h, *angusta* ♂ and ♀; i, *squamata* ♂ (after Budde-Lund); j, *lata* ♀; k-m, *capensis* ♂ (three forms); n, *capensis* ♀. (In all cases the inner margin to right.)

Pleopod 1, outer branch about as broad as long, in ♂ outer margin with a triangular projection near apex (or apex can be described as having a semicircular or angular excision); in ♀ outer margin angularly incised.

Uropod, outer ramus longer than peduncle.

Up to 16×8 mm. Slaty-grey, with lighter mottling on head and peraeon, telson and each pleon segment with 2 small pale dots, often inconspicuous or absent, antennae grey, legs pale, eyes black.

Localities.—Cape Province: Cape Town and Simonstown (Budde-Lund, also R. M. L., K. H. B.); Port Elizabeth (Budde-Lund: *truncata* and *hirsuta*); Kamaggas and Steinkopf (Budde-Lund: *brunnea*); Faure (W. F. P.); Saldanha Bay (K. H. B.); Vredenburg and Clanwilliam (S.A. Mus.); Garies and Kamieskroon (A. J. H. and R. F. L.); Lilyfontein (K. H. B.); Tulbagh (W. F. P.); Steinthal, Tulbagh (K. H. B.). Damaraland: Walvis Bay (Budde-Lund); Okahandja (Panning).

There is little doubt that *brunnea* is synonymous. A specimen in the Budde-Lund collection in the British Museum labelled *brunnea* is nearly uniform slaty-grey. Specimens which have been long in alcohol fade to a pale straw or fulvous colour.

Of the numerous specimens examined I have not found one with the number of ocelli typical for *truncata* (10); the number varies irrespective of locality between 12 and 16.

I am inclined to regard *hirsuta* as a young *truncata*. The outer branch of pleopod 1 (labelled as that of ♀ in Budde-Lund's figure 31, but obviously a typ. laps.) is exactly like that of *truncata*. Budde-Lund recorded both species from Port Elizabeth; in fact, the specimens of both species were collected by Dr. Brauns on the same day, and it is highly probable that they were found actually together. The young of *truncata* (3-5 mm.) frequently have a few long setae on the epimera, but these are usually lost in specimens as long as 7 mm. Budde-Lund does not indicate them in his figure 30. As mentioned below, the antennae are relatively longer in juveniles.

The following growth-changes take place. In juveniles taken from the brood-pouch the telson is bluntly triangular, the sides slightly convex, and projects very much beyond the pleurae of 5th pleon segment. In specimens about 3.5 mm. in length the telson has straight sides and the apex still projects beyond the 5th pleurae. At about 5 mm. the telson has assumed its adult form.

The 2nd antennae in young specimens are proportionately longer than in the adult, and the clavate setae are far more numerous and prominent.

The outer branch of pleopod 1 in young specimens (3.5 mm.) of both sexes resembles that of adult *capensis*. In the ♂ the projection on the middle of outer margin gradually shifts distally. Consequently it is difficult to separate young specimens of this species from *capensis*, unless they are caught in association with the adults, though they are usually paler in colour and lack the lateral pale marks on the peraeon.

This species is confined to the lower levels and does not ascend the upper slopes of the mountains.

Niambia flavescens Brnrd.

(Fig. 23, c, d.)

1924. *Niambia flavescens*. Barnard, Ann. S. Afr. Mus., xx, p. 233, fig. 2.

Surface closely and distinctly granulate.

Lateral lobes of head rather better developed and more prominent than in other species. Eyes small, ocelli 10.

Projecting portions of pleurae about $1\frac{1}{2}$ times mid-dorsal length of segments; 5th extending at least to level of telsonic apex, usually a little beyond. Telson very short, sides concave, apex acute, dorsally impressed.

Antenna 2 reaching to end of peraeon segment 1, 4th joint a little longer than 3rd, 5th a little longer than 4th, flagellum a trifle shorter than 5th, its 2nd joint twice length of 1st.

Peraeopods 1-3 in ♂ as in *truncata*.

Pleopod 1, outer branch about as broad as long, outer margin incised, more deeply so in ♀ than in ♂.

Uropod, outer ramus equal to peduncle.

8 × 3 mm. Pale slaty-grey, with pale yellowish markings, antennae and legs pale.

Localities.—Ovamboland: several localities (Barnard), as far north as Namakunde on the boundary line of Angola.

Niambia damarensis (Pann.).

1924. *Thomsonia damarensis*. Panning, Beitr. Kennt. Land. Süßwasserf. S.W.A., ii, p. 173, fig. 1.

Surface with regularly spaced minute backwardly directed spines.

Eyes very small, number of ocelli ?.

Projecting portions of pleurae twice mid-dorsal length of segments; 5 extending beyond level of telsonic apex. Telson very short, sides concave, apex acute.

Antenna 2 very short, scarcely reaching end of peraeon segment 1, 3rd and 4th joints subequal, 5th $1\frac{1}{2}$ times as long, flagellum slightly shorter than 5th, its 1st joint slightly shorter than 2nd.

Peraeopod 1 with thick brush of spines on 4th and 5th joints.

Pleopods ?.

Uropod, outer ramus shorter than peduncle.

10 × 5.3 mm. Brownish yellow with lighter markings.

Locality.—Damaraland: 50 km. south of Waterberg (Panning).

The above characters are taken from Panning's description. It is not clear what the words "Die Analfüsse sind . . . kaum länger als das Telson" mean; unless the *width* of the telson is intended. The figure shows the uropods slightly shorter than the width, and much longer than the length of the telson. The description does

not mention the pleopods. The original specimens should be re-examined.

Niambia griseo-flavus Brnrd.

(Fig. 23, e, f.)

1924. *Niambia* (?) *griseo-flavus*. Barnard, Ann. S. Afr. Mus., vol. xx, p. 234, fig. 3.

Surface minutely granulate.

Eyes small, ocelli 10.

Projecting portions of pleurae twice mid-dorsal length of segments, 5 projecting beyond level of telsonic apex. Telson very short, sides concave, apex acute, dorsally impressed.

Antenna 2 short, reaching to or almost to end of peraeon segment 1, 3rd and 4th joints subequal, 5th a little longer, flagellum shorter than 5th, its 2nd joint twice length of 1st.

Peraeopods 1-3 in ♂ as in *truncata*.

Pleopod 1, outer branch about as broad as long in ♂, broader in ♀, cordiform, outer margin slightly sinuous, more so in ♀ than in ♂.

Uropod, outer ramus shorter than peduncle.

10 × 3.5 mm. Pale slaty-grey, with pale yellow markings, the yellow colour sometimes predominating, antennae and legs pale, uropods more or less suffused.

Localities.—Ovamboland: Andoni (Barnard).

Damaraland: Namutoni (K.H.B.); Otjituo (R.W.E.T.).

I think it very probable that these specimens are really Panning's species *damarensis*, but as the pleopods of the latter are not described, and there are other uncertainties (see p. 263), I keep the two forms separate. The very slender spine on the outer lobe of maxilla 1 is not present in this species, of which several examples have been specially examined in this respect; moreover, the normal number of the inner series of spines appears to be only 4, though in one case 5 were found.

Niambia pallida B-L.

1909. *Niambia pallida*. Budde-Lund in Schultze, Reise, ii, p. 61, pl. vi, figs. 26-28.

1910. „ „ Stebbing, Gen. Cat. S. Afr. Crust., p. 441.

Eyes small, ocelli 14.

Pleurae of pleon segment 5 much shorter than telson, which is apically impressed.

Antenna 2 equal to two-fifths body length, 4th joint slightly longer than 3rd.

Pleopod 1, outer branch broader than long, in ♂ apex blunt, outer margin slightly incised near apex, in ♀ outer margin sharply incised about in middle (*cf.* fig. 23, *d* of *flavescens*).

8-10 × 3-4 mm. Pale grey, mottled with whitish laterally.

Localities.—Cape Province : Steinkopf (Budde-Lund).

Great Namaqualand : Kubub (near Lüderitzbucht) and Possession Island (Budde-Lund).

Niambia modesta B-L.

1909. *Niambia modesta*. Budde-Lund in Schultze, Reise, ii, p. 62, figs. 32-34.

1910. „ „ Stebbing, Gen. Cat. S. Afr. Crust., p. 442.

1924. „ „ Panning, Beitr. Kennt. Land. Süßwasserf. S.W.A., ii, p. 173.

Eyes small, ocelli 9.

“Epistome with the bulbous frons produced” (Budde-Lund).

Pleurae of pleon segment 5 much shorter than telson, which is apically impressed.

Antenna 2 scarcely exceeding one-third body length, 3rd and 4th joints subequal.

Pleopod 1, outer branch in ♂ and ♀ as in *pallida*.

6 × 2.5 mm. Pale grey, subunicolorous.

Localities.—Damaraland : Grootfontein (Budde-Lund).

Great Namaqualand : Lüderitzbucht, Kuibis, and Seeheim (Panning).

It is probable that this form will prove synonymous with *pallida*. Kubub, whence the latter was recorded, lies between Lüderitzbucht and Kuibis. The descriptions of the two species disclose no essential difference, unless it be in the epistome and frons. In the absence of comparative figures it is impossible to say how far this is merely a verbal difference.

Niambia angusta B-L.

(Fig. 23, *g, h*.)

1909. *Niambia angusta*. Budde-Lund in Schultze, Reise, ii, p. 63, pl. vi, figs. 35-37.

1910. „ „ Stebbing, Gen. Cat. S. Afr. Crust., p. 442.

1924. „ „ Panning, Beitr. Kennt. Land. Süßwasserf. S.W.A., ii, p. 173.

Surface with very faint indications of granules.

Eyes with 12-14 ocelli.

Projecting portions of pleurae about as long as mid-dorsal length of segments ; of 5 extending to level of about half telsonic length.

Telson, sides concave, apex acute, dorsally impressed.

Antenna 2 extending to end of peraeon segment 1 or a little beyond, 4th joint $1\frac{1}{2}$ times 3rd, 5th subequal to 3rd plus 4th, flagellum subequal to 5th, its 2nd joint twice length of 1st.

Peraeopods 1-3 in ♂ as in *truncata*.

Pleopod 1, outer branch about as broad as long, cordiform, outer margin slightly sinuous, more so in ♀ than in ♂.

Uropod, outer ramus longer than peduncle.

7-8 × 2.5-3 mm. Pale slaty-grey, mottled, eyes black.

Localities.—Cape Province : Steinkopf (Budde-Lund) ; Lilyfontein (K. H. B.) ; Clanwilliam (R. M. L.) ; Matjesfontein and Triangle * (W. F. P. and R. M. L.).

Great Namaqualand : Lüderitzbucht (Panning).

Niambia capensis (Dollf.).

(Figs. 23, *k-n* ; 24, *c-i*.)

1895. *Metoponorthus capensis*. Dollfus, Mem. Soc. Zool. Fr., viii, p. 350, fig. 9.
1904. *Niambia* ,, Budde-Lund, Rev. Crust. Isop. Terr., p. 37.
1906. ,, ,, *Id.*, Deutsch. Südpol. Exp., ix, p. 89.
1909. ,, ,, *Id.*, in Schultze, Reise, ii, p. 63, pl. vi, figs. 39, 40.
1909. ,, *pusilla*. *Id.*, *ibid.*, p. 63, pl. vi, fig. 38.
1909. ,, *marginepapillosa*. *Id.*, *ibid.*, p. 64, pl. vi, fig. 41.
1910. ,, *capensis*. Stebbing, Gen. Cat. S. Afr. Crust., p. 441.
1910. ,, *pusilla* and *marginepapillosa*. *Id.*, *ibid.*, p. 442.

? *non* Panning, 1924, p. 173 (*pusilla*).

Surface with faint indications of granules.

Eyes with 12-16 ocelli.

Projecting portions of pleurae subequal to mid-dorsal length of segments, of 5 not extending to level of telsonic apex.

Telson, sides concave, apex acute, slightly impressed dorsally.

* Now called Matroosberg on the railway.

Antenna 2 extending to end of peraeon segment 2, 4th joint distinctly longer than 3rd, 5th subequal to 3rd plus 4th, flagellum subequal to 5th, its 1st joint distinctly longer than broad.

Peraeopods 1-3 in ♂ as in *truncata*.

Pleopod 1, outer branch usually longer than broad, outer margin in ♂ with a triangular, subacute process about in middle, in ♀ sinuous.

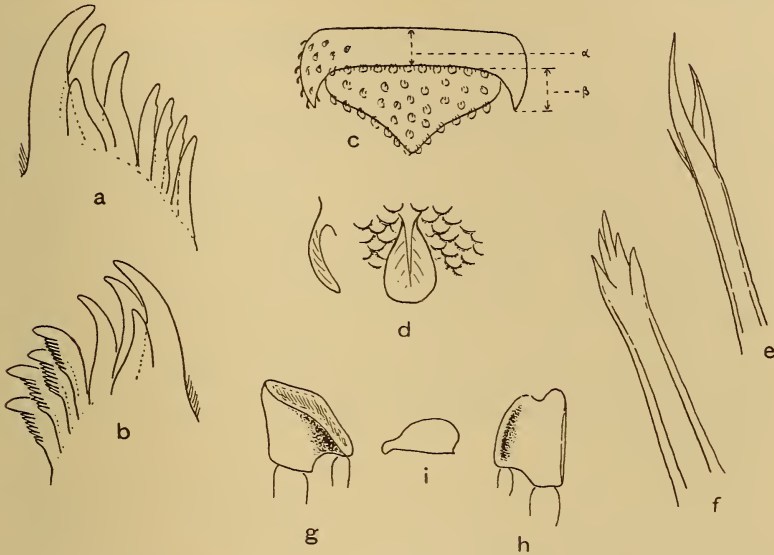


FIG. 24.—*Niambia*. *a, b*, Apex of outer lobe of maxilla 1 of *Niambia* sensu stricto and *Manibia* subgen. n. *N. capensis*: *c*, 5th pleon segment and telson, indicating how the relative lengths of the segment (α) and its pleural portion (β) are measured; *d*, surface and one scale-spine further enlarged, with profile of latter; *e, f*, spines from peraeopod 1 of ♂ and ♀ respectively; *g, h*, dorsal and ventral views of peduncle of uropod; *i*, cross-section of peduncle of uropod, dorsal surface uppermost, outer margin to right.

Uropod, outer ramus longer than peduncle.

Up to 6×2.5 mm., or slightly larger, up to 8×4 mm. Slaty-grey, mottled with paler on head and peraeon, usually a pale lateral mark on each peraeon segment (where the epimera join the segments), each pleon segment with 2 small pale dots, often faint or absent, but when present the two series converge posteriorly, antennae grey, legs more or less suffused, eyes black. Occasionally the peraeon is predominantly yellowish with 3 longitudinal dark stripes.

Localities.—Cape Province: Cape Town (Dollfus); Simonstown (Budde-Lund); Cape Peninsula generally (W. F. P., R. M. L., K. H. B.); Riebeck Kasteel (K. H. B.); Gouda (R. M. L.); Citrusdal

(K. H. B.); Clanwilliam (R. M. L.); Bitterfontein (K. H. B.); Lilyfontein (K. H. B.); Gordons Bay (W. F. P.); Caledon (W. F. P., K. H. B.); River Zonder End (K. H. B.); Swellendam (K. H. B.); Riversdale (K. H. B.); Ceres (W. F. P.); Forebay (K. H. B.); Pocaltsdorp and George (W. F. P.); Graaf Reinets and Beaufort West (S. H. H.); Avontuur (W. F. P.); Doorn River, Oudtshoorn District (S. H. H. and C. T.).

It seems clear that *pusilla* and *marginepapillosa*, recorded by Budde-Lund from the same locality as *capensis*, are synonymous, at least with Budde-Lund's species. It is not clear whether Budde-Lund actually saw Dollfus' type, but there is a noticeable conflict between Budde-Lund's concept of *capensis* and Dollfus' figure as regards the extent of the pleurae of pleon segment 5. Nor have I seen among the specimens here referred to *capensis* any with such slender 2nd antennae as shown in Dollfus' figure, in which they correspond more with those of a *Gerufa* than a *Niambia*. I have, however, seen a Cape Town specimen corresponding exactly in coloration with Dollfus' description.

Panning has recorded *pusilla* from Penguin Island, off Lüderitzbucht; but unless a large series of specimens is collected at one and the same time and place, the identification of such small specimens is very uncertain.

Similar growth changes to those mentioned under *truncata* occur in this species also, as regards the antennae and telson. In young ♂ the outer branch of pleopod 1 has the outer margin entire, the projection develops gradually.

Like *truncata*, this species inhabits low levels and the lower slopes of the mountains; in the Cape Peninsula it does not seem to ascend above 1000 or 1500 feet. I have found it under logs on a sandy beach (Forebay).

Niambia formicarum n. sp.

Resembling very closely *capensis*. Antenna 2 shorter and stouter, reaching only to end of pereon segment 1, 5th joint not as long as 3rd plus 4th, flagellum slightly shorter than 5th, its 1st joint scarcely longer than broad.

Eyes small, inconspicuous, 8-9 ocelli.

5-8 × 2.25-4 mm. Uniform pale yellowish or cream, eyes rather pale.

Localities.—Cape Province: River Zonder End (K. H. B.); Caledon (K. H. B.); Matjesfontein (W. F. P.); Touws River (R. M. L.); Laingsburg (W. F. P.); Prince Albert Pass (W. F. P.); Clanwilliam (S.A. Mus.).

This form is scarcely more than a variety of *capensis*, though it differs markedly in the number of ocelli. The habitat, however, is different as it seems always to be associated with ants (*Messor* and *Camponotus*). Two ♀♀ from a termite nest at Fort Brown (Albany Mus.) appear to belong to this species, but in the absence of ♂♂ they are not definitely assigned here.

Niambia longicauda Brnrd.

(Fig. 25.)

1924. *Niambia* (?) *longicauda* Barnard, Ann. S. Afr. Mus., xx, p. 235, fig. 4.

Surface minutely granulate.

Eyes small, ocelli 10.

Projecting portions of pleurae twice mid-dorsal length of segments, 5 extending to level of about $\frac{2}{3}$ – $\frac{3}{4}$ telsonic length. Telson nearly as long as broad, lateral margins strongly concave, converging to long acute apex, dorsally impressed.

Antenna 2 reaching to, or a trifle beyond, end of peraeon segment 1, 4th joint distinctly, though not greatly, longer than 3rd, 5th slightly longer than 4th, flagellum shorter than 5th, its 2nd joint twice 1st.

Peraeopods 1–3 in ♂ as in *truncata*, but the spines very stout, apically slightly clavate, 3- or 4-dentate.

Pleopod 1, outer branch longer than broad, especially in ♂, apex rounded, outer margin excised, outer and inner margins in ♂, outer margin in ♀, thickly set with very minute scabrosities.

Pleopod 2, outer branch in ♂ subtriangular, longer than broad, apex acute, outer margin minutely scabrous.

Uropod, outer ramus subequal to peduncle.

5 × 2 mm. Slaty-grey, with pale markings, antennae and legs pale, uropods more or less suffused.

Localities.—Damaraland: Sandup (Barnard); Tsumeb (K. H. B.);

Namutoni (K. H. B.); Outjo (K. H. B.).

Ovamboland: Andoni (Barnard).

Kaokoveld: Kamanyab (K.H.B.); Warmbad (R.F.L.);

Kaoko Otavi (K. H. B.).

A very distinctive species, both in the telson and the pleopods.

Manibia subgen. n.

Differing from typical *Niambia* in having the inner spines of the outer lobe of maxilla 1 strongly serrate. Flagellum of antenna 2 with the 2nd joint $2\frac{1}{2}$ –3 times the length of the 1st.

In both the species described below no more than 4 inner spines on the outer lobe of maxilla 1 could be detected (cf. *griseo-flavus*).

This subgenus bears a similar relationship to *Niambia* as *Benthana* and *Benthanops* do to *Philoscia*.

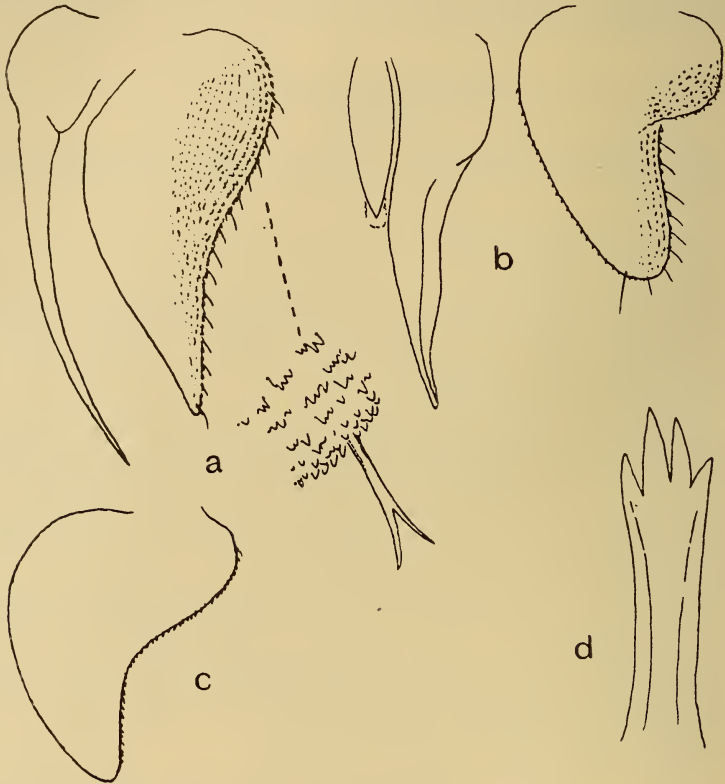


FIG. 25.—*Niambia longicauda* Brnr. a, Pleopod 2 ♂ with portion of margin further enlarged; b, penis and pleopod 1 ♂, outer ramus separated; c, outer ramus of pleopod 1 ♀; d, spine from 5th joint of peraeopod 1 ♂.

Niambia (Manibia) lata n. sp.

(Figs. 23, j ; 24, b ; 26.)

Unusually broad. Surface minutely granulate.

Head deeply sunk in peraeon segment 1, the antero-lateral angles of the latter extending to the anterior margin of eyes. Eyes small, ocelli 10.

Epimera of segments 2-4 in ♀ demarcated.

Projecting portions of pleurae $1\frac{1}{2}$ -2 times mid-dorsal length of segments, 5 extending to level of telsonic apex. Telson very short, sides concave, apex acute, dorsally impressed.

Antenna 2 reaching slightly beyond end of peraeon segment 1, 4th joint slightly longer than 3rd, flagellum a little longer than 5th, its 2nd joint 3 times 1st.

Pleopod 1, outer branch in ♀ about as long as broad, apex blunt, outer margin angularly incised.

Uropod, outer ramus longer than peduncle.

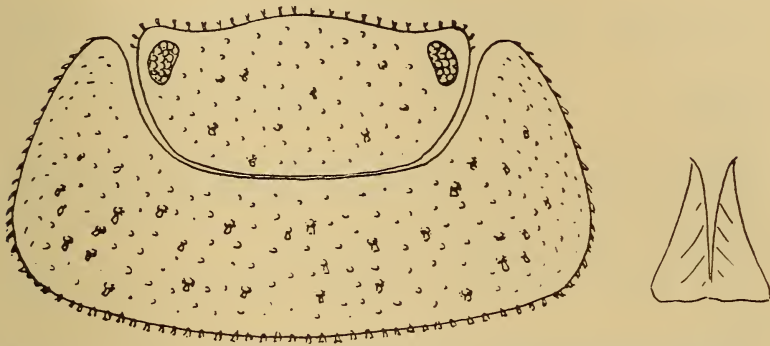


FIG. 26.—*Niambia* (subgen. *Manibia*) *lata* n. sp. Head and peraeon segment 1, with scale-spine further enlarged.

4.5 × 2.8 mm. As preserved, pale grey, with lighter markings, antennae, legs and uropods pale.

Locality.—S. Rhodesia: Sanyati Valley (S.A. Mus.).

This species is considerably broader proportionately to its length than any other species of *Niambia*. The single ovigerous ♀ was collected by Capt. R. H. Stevenson.

Niambia (*Manibia*) *microps* n. sp.

Not unusually broad. Surface minutely granulate.

Head not deeply sunk in peraeon segment 1, resembling typical *Niambia*. Eyes very small, ocelli 6.

Epimera of segments 2-4 in ♀ demarcated.

Projecting portions of pleurae $1\frac{1}{2}$ times mid-dorsal length of segments, 5 extending nearly to level of telsonic apex. Telson very short, sides concave, apex acute, dorsally impressed.

Antenna 2 reaching to end of peraeon segment 1, 3rd and 4th joints subequal, flagellum equal to 5th, its 2nd joint $2\frac{1}{2}$ times 1st.

Pleopod 1, outer branch in ♀ resembling that of *lata*.

Uropod, outer ramus longer than peduncle.

4.5 × 2 mm. (ovig. ♀). As preserved, yellowish with indications of slaty-grey coloration, antennae, legs pale, eyes black.

Locality.—Portuguese East Africa: Maxixe, near Inhambane (R. F. L.).

Although no ♂ is present, the small number of ocelli indicate that this form is distinct from any of the other species.

Gen. GERUFA B-L.

1909. *Gerufa*. Budde-Lund in Schultze, Reise, ii, p. 58 (subgen. of *Porcellio*).

1910. ,, *Id.*, Sjöstedt, Kilimandjaro-Meru Exp., iii, 21, pp. 8, 9, 10.

Surface shagreened, densely covered with usually clavate or battle-dore-shaped scales, which are most numerous laterally and on the margins of the segments, and on telson; sometimes the scales may be spine-like or apically forked.

Head discrete. Eyes large, prominent, ocelli at least 18, usually 20–22.

Epimeral sutures present on segments 2–4 in ♀.

Pleurae of pleon segments 3–5 well developed.

Telson short, rounded-triangular, dorsally convex, not impressed.

Antenna 2 long, slender, flagellum 2-jointed, 1st joint $\frac{1}{2}$ – $\frac{3}{4}$ length of 2nd.

Mouth-parts as in *Niambia* (*sensu stricto*).

Peraeopods as in *Niambia*. Dactylar seta apically acute.

Pleopods without pseudotracheae.

Uropod, peduncle stout, external surface flattened and impressed, *i.e.* triquetral in cross-section, the dorsal margin marked by a faint keel, the ventral margin by a strong keel, outer ramus longer than peduncle, slender.

Although closely allied to *Niambia*, this genus is easily distinguished by the flattened outer surface of the peduncle of uropod, and the more slender outer ramus of uropod, and antenna 2.

Contrary to what is found in *Niambia*, where the outer branch of pleopod 1 in ♂ often forms useful specific characters, there is in the present genus a uniformity which renders this appendage of no specific value.

In conflict with Budde-Lund's statement and figure, I find only 4

large inner spines on the outer lobe of maxilla 1, as in *Niambia*. Owing to the refraction of the chitin of these spines, and the frequent overlapping of their bases, an optical illusion is easily possible causing the appearance of a slender and shorter simple spine between two of the apically bifid ones (cf. Budde-Lund's fig. 46, pl. vi, 1909). The only certain way to determine the number of spines is to separate and splay them with a fine needle before mounting on the slide.

The species of this genus are typically mountain forms.

This genus is not to be confused with the Eubeline genus *Gerutha* B-L., 1912.

Key to the South African species.

1. Scale-spines clavate, subtriangular.
 - a. Eyes not very large.
 - i. Smaller : 7 × 3 mm. *hirticornis*.
 - ii. Larger : 11 × 5 mm. *montana*.
 - b. Eyes very large *macrops*.
2. Scale-spines hair-like, slender, apically forked *marmorata*.

Gerufa hirticornis B-L.

(Fig. 27.)

1909. *Gerufa hirticornis*. Budde-Lund in Schultze, Reise, ii, p. 59, pl. vi, figs. 42-56.
1910. „ „ Stebbing, Gen. Cat. S. Afr. Crust., p. 442.

Surface with numerous low rounded granules, scale-spines subtriangular, apically truncate.

Eyes with 20-22 ocelli.

Projecting portions of pleurae $1\frac{1}{2}$ times longer than mid-dorsal length of segments, 5 not extending to level of telsonic apex. Telson rounded triangular, sides straight or slightly convex.

Antenna 2 reaching to middle or end of peraeon segment 3, with rather long outstanding setae arranged in longitudinal rows.

Peraeopods 1-3 in ♂, 4th and 5th joints with numerous spines on lower surface; in ♀ spines less numerous. The marginal spines in all the peraeopods in both sexes are more or less expanded, in some cases a single expansion on either side, in some cases a double expansion; sometimes no expansion at all is visible.

Pleopod 1, outer branch in ♂ as broad as long, apex blunt, outer margin nearly straight; in ♀ broader than long.

Uropod, outer ramus $1\frac{3}{4}$ to almost 2 times length of peduncle.

Up to 7 × 3 mm. (♂♂ smaller than ♀♀). Slaty-grey, with pale mottling on head and peraeon, a series of pale marks along each side at junctions of epimera, and often another pale mark externally, pleon usually with 2 large pale spots on each segment, the two series diverging posteriorly, telson also with pale marks, antennae, legs and uropods suffused with grey, eyes black.

Localities.—Cape Province: Cape Flats (Budde-Lund); Cape Peninsula (K. H. B.); French Hoek (W. F. P.); Hottentots Holland

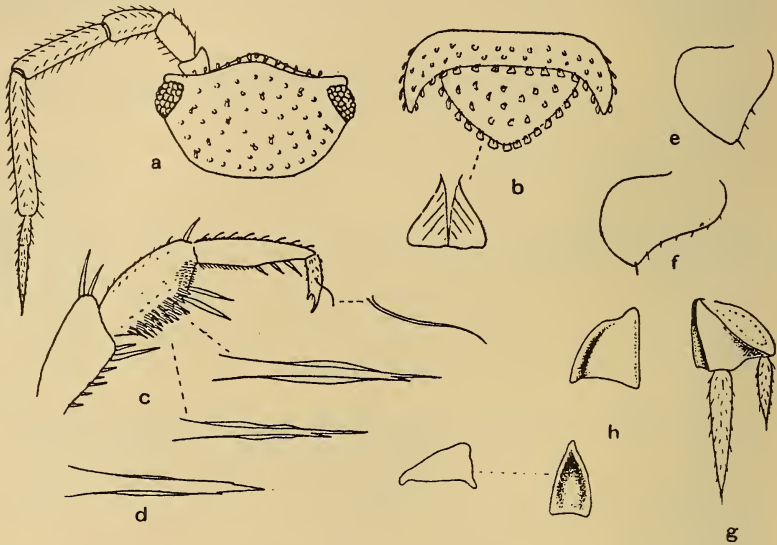


FIG. 27.—*Gerufa hirticornis* B-L. a, Head and antenna 2; b, pleon segment 5 and telson, with scale-spine further enlarged; c, distal joints of peraeopod 1 ♂, with dactylar seta and 2 spines further enlarged; d, spine from peraeopod of ♀; e, f, outer ramus of pleopod 1 ♂ and ♀ respectively (inner margin to left); g, dorsal view of left uropod; h, ventral view of peduncle of uropod, with outer view and cross-section, in the latter dorsal surface above, outer margin to right.

Mts. (K. H. B.); Wellington Mts. (K. H. B.); Great Winterhoek Mts., Tulbagh (K. H. B.); Waaihoek Mts., Goudini (K. H. B.); Keeromberg and Hex River Mts., Worcester Distr. (K. H. B.); Riebeck Kasteel Mt. (K. H. B.); Kleinmond Mts. (K. H. B.); Caledon (K. H. B.); Montagu (K. H. B.); Langeberg Mts. at Swellendam, Riversdale, and Heidelberg (K. H. B.); Seven Weeks Poort Berg in the Zwartberg Range (K. H. B.); Doorn River, N. of Montagu Pass, Outeniqua Range (S. H. H. and C. T.); Cedarberg Mts., Clanwilliam (K. H. B.).

The two rows of short stout spines on the 2nd joint of antenna 2

shown in Budde-Lund's figure are not apparent. The irregularity in the occurrence of the expansions on the spines on the pereopods may possibly be due to some action of the preserving fluid; nevertheless these peculiar spines seem to be characteristic.

Although Budde-Lund recorded this species from the Cape Flats (coll. Schultze) I have not found it in such low-lying localities; it occurs on the slopes of the mountains from about 1000 ft. upwards (Cape Peninsula), and is a characteristic mountain woodlouse, living at 5000 ft. on the Great Winterhoek Mts. and Langeberg Range, and 7000 ft. on the Zwartberg Range.

The diverging series of large pale spots on the pleon, often confluent into two stripes, are characteristic, though they may be entirely obsolete. Contrast the *converging* series of *small* dots in *Niambia capensis*.

Gerufa montana n. sp.

(Fig. 28, c.)

Surface with faint indications of granules, scale-spines rather narrow, apically more or less bifid.

Eyes with 20 ocelli.

Projecting portions of pleurae $1\frac{1}{2}$ -2 times longer than mid-dorsal length of segments, 5 extending to level of about two-thirds length of telson. Telson triangular, sides straight, apex narrowly rounded, slightly convex dorsally.

Antenna 2 extending to about middle of pereon segment 3, slender, 4th joint nearly twice as long as 3rd, flagellum shorter than 5th, subequal to 4th, its 1st joint about three-quarters length of 2nd. The rows of outstanding setae relatively shorter and less conspicuous than in *hirticornis*.

Pereopods and pleopods as in *hirticornis*.

Uropod, outer ramus $1\frac{3}{4}$ times length of peduncle.

11 × 5 mm. Slaty-grey, with lighter markings on either side of median line, pleon uniform, telson with 2 pale dots, epimeral sutures on segments 2-4 in ♀ marked with pale lines, antennae grey, legs and uropods more or less suffused, eyes black.

Localities.—Cape Province: Great Winterhoek Mts., Tulbagh, 5000 ft. (K. H. B.); Langeberg Range, N. of Riversdale and Heidelberg, 3500-4000 ft. (K. H. B.); Seven Weeks Poort Berg in Zwartberg Range, 7000 ft. (K. H. B.).

This species resembles *hirticornis* in the relative size of the eyes and other features, but is a much larger species.

Gerufa macrops n. sp.

(Fig. 28, a, b).

Surface with faint indications of granules, scale-spines subtriangular, less numerous and narrower than in *hirticornis*, apically excised.

Eyes very large, composed of 18 large ocelli.

Projecting portions of pleurae $1-1\frac{1}{2}$ times mid-dorsal length of segments, 5 not reaching level of telsonic apex.

In other respects resembling *hirticornis*.

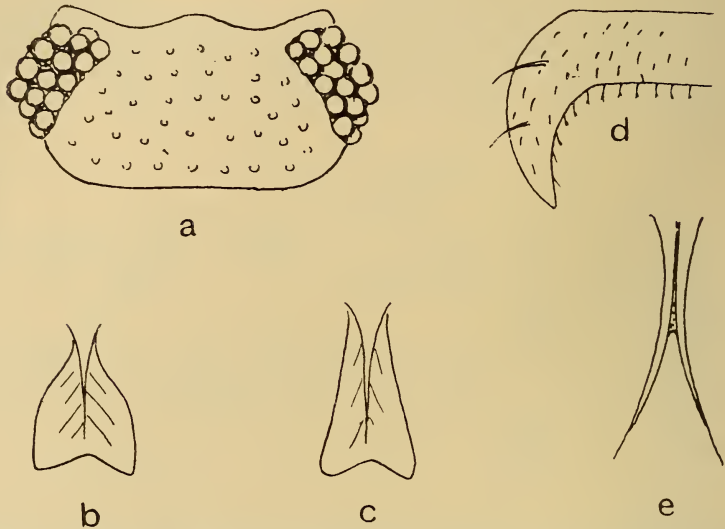


FIG. 28.—*Gerufa*. a, b, Head and scale-spine of *macrops* n. sp.; c, scale-spine of *montana* n. sp.; d, e, part of 5th pleon segment, and scale-spine of *marmorata* n. sp.

10 × 5 mm. (♂♂ smaller). Colour as in *hirticornis*, but more frequently mottled, *i.e.* the dark and light colours more equal in proportion, sometimes the pale colour predominating.

Localities.—Cape Province: Oudebosch, River Zonder End Mts. (K. H. B.); Swellendam Mts. (K. H. B.).

This species is also a mountain species. It does not, however, occur in such open habitats on the slopes or near the crests of the ranges as *hirticornis*, but in the forest and bush in the ravines. Thus it is common in the Oudebosch at River Zonder End, and in the upper portions of the "Duivelsbosch" at Swellendam.

Though composed of fewer ocelli than in *hirticornis*, the eyes are much larger; the head looks almost like that of a *Ligia*.

Gerufa marmorata n. sp.

(Fig. 28, *d*, *e*.)

Surface with faint indications of granules, thickly covered with slender spine-like or hair-like scale-spines, with a few scattered longer ones laterally on the epimera and pleura, the scale-spines on the hind margins of the segments and on the telson slender, deeply forked.

Eyes with 20 ocelli.

Projecting portions of pleurae $1\frac{1}{2}$ –2 times mid-dorsal length of segments, 5 extending to about level of half telsonic length. Telson rounded-triangular, sides straight or very slightly concave, apex blunt, not dorsally impressed.

Antenna 2 extending to end of peraeon segment 2, or middle of 3.

Peraeopods and pleopods as in *hirticornis*.

Uropod, outer ramus $1\frac{1}{2}$ times length of peduncle.

10–11 × 4–5 mm. (♂♂ smaller). Various mottled and marbled with slaty-grey, rufous, fulvous brown, orange, or yellow, some specimens predominantly slaty-grey, others rufous, fulvous, or yellowish, antennae and uropods grey, brown or reddish, legs more or less suffused, eyes black.

Localities.—Cape Province: George (K. H. B.); Wilderness, near George (S. H. H. and C. T.); Knysna (R. F. L. and J. D.); Keurbooms River (K. H. B.); Doorn River, N. of Montagu Pass, Outeniqua Range (S. H. H. and C. T.).

This very beautiful species is common in the bush and forest areas of the above localities. The colour pattern is quite different from that of the other species.

Inchanga n.g.

Surface thickly covered with scale-spines, obovate in shape.

Head discrete, with frontal margin. Eyes small, 8–10 ocelli.

Epimera of segments 2–4 in ♀ demarcated.

Pleurae of pleon segments 3–5 well developed.

Telson triangular, apically acute.

Antenna 2, flagellum 2-jointed, 2nd much longer than 1st.

Mandible with a single free penicil, molar penicil with short stem and several branches, outer margin without spines.

Maxilla 1, outer lobe with 4 + 4 spines, one of the outer spines very slender, 2 of the inner spines feebly bifid, 2 simple; inner lobe with 2 subequal plumose setae.

Maxilliped, inner plate with 2 denticles near outer distal corner, and 1 spine near inner distal corner.

Peraeopods 1-3 more strongly spinose in ♂ than ♀. Dactylar seta slender, acute.

Pleopods with rudimentary pseudotracheae.

Uropod, peduncle with fine longitudinal keel on outer margin, and distally slightly excised, inner ramus inserted proximally.

This genus somewhat resembles *Trichorina*, but the peduncle of uropod is like that of *Agnara* or *Angara* (= *Agabiformius*) (subgenera of *Porcellio*). From *Nagara* (also a subgen. of *Porcellio*) it differs in having no spines on outer margin of mandible. The outer lobe of maxilla 1 with its very slender spine is distinctive, though reminiscent of *Thomsonia* (p. 258).

Inchanga natalensis n. sp.

(Fig. 29.)

Surface finely and closely covered with larger and smaller granules, the larger ones forming two more or less distinct transverse series on peraeon segments 2-4, and a single series on segments 5-7.

Head, frontal margin distinct, costate, slightly produced in middle, lateral lobes small, considerably below level of front margin, rounded, front minutely granulate, slightly bulbous in middle and concave below. Eyes small, 8-10 ocelli.

Antero-lateral angles of peraeon segment 1 rounded, reaching eyes.

Projecting portions of pleurae twice mid-dorsal length of segments, 5 not reaching telsonic apex. Telson triangular, sides concave, apex acute, dorsally impressed.

Antenna 2 reaching only just beyond end of 1st peraeon segment, 3rd and 4th joints subequal, 5th shorter than 3rd plus 4th, flagellum shorter than 5th, its 1st joint one-third length of 2nd.

Pleopod 1, outer branch longer than broad, in ♂ apex acute, outer margin strongly sinuous, in ♀ apex subacute, outer margin less sinuous.

Uropod, peduncle not quite reaching telsonic apex, outer margin flattened, with a keel on lower margin, and apically shortly incised, outer ramus longer than peduncle, outer margin feebly keeled, inner ramus more than half length of outer ramus, slender.

4.5 (♂)-6.5 (♀) × 2-3 mm. Pale straw, faintly irrorated with light grey along the sides of peraeon and pleon, and hind margins of peraeon segments, eyes black.

Locality.—Natal: Inchanga (K. H. B., 1917).

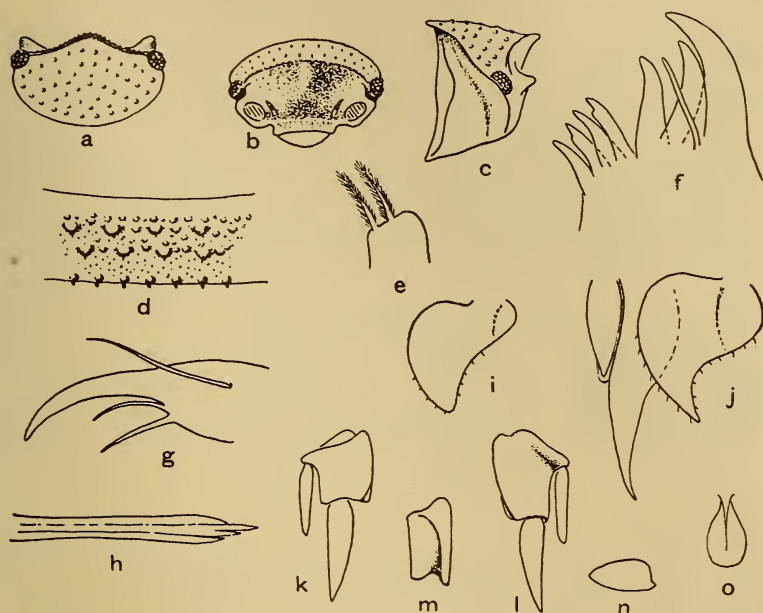


FIG. 29.—*Inchanga natalensis* n.g., n. sp. *a, b, c*, Dorsal, frontal, and lateral views of head; *d*, portion of peraeon segment 2; *e, f*, apices of inner and outer lobes of maxilla 1; *g*, dactylus of pereopod; *h*, spine from 5th joint of pereopod 1; *i*, outer ramus of pleopod 1 ♀; *j*, penis and pleopod 1 ♂; *k, l*, dorsal and ventral views of uropod; *m*, outer view of peduncle of uropod; *n*, cross-section of peduncle of uropod, dorsal surface above, outer margin to right; *o*, scale-spine.

Inchanga (?) *virgiliae* n. sp.

(Fig. 30.)

Peraeon strongly convex, the epimera bent outwards nearly horizontally. Surface with larger and more closely set granules than in *natalensis*, but covered with similar scale-spines. Granules forming about 5 transverse series on peraeon segment 1, and 3 series on segments 2-7.

Head similar in structure to that of *natalensis*, but the front more strongly produced in the middle line, and the lateral lobes larger and more prominent.

Epimera subquadrangular, anterior angle of 1st somewhat acutely produced forwards.

Antenna 2 missing. In other respects, including the mouth parts, pereopods with their spines, and the uropods agreeing with *natalensis*.

4.5 × 1.5 mm. Pale greyish, epimera and pleurae with unusually wide pale margins (dotted line in figure).

Locality.—Cape Province: Keurbooms River, Plettenberg Bay District (K. H. B., 1931).

A single specimen found under a log on the banks of the estuary (*Virgilia capensis*, the Keurboom tree).

Although resembling *natalensis* in the structure of the head and the mouth parts, the strongly convex body with its nearly horizontal

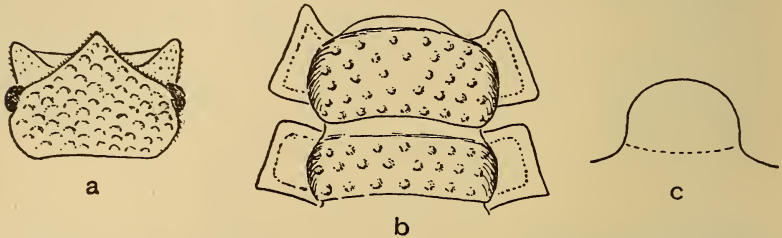


FIG. 30.—*Inchanga* (?) *virgiliae* n. sp. *a*, Dorsal view of head; *b*, peraeon segments 1 and 2; *c*, diagrammatic cross-section of peraeon.

epimera is so different that I place the species in the genus *Inchanga* with some considerable doubt, pending the discovery of more material.

Krantzia n.g.

Surface sparsely covered with minute obovate scale-spines.

Head concrete, lateral margin continued round below eye on to lateral lobe, frontal margin distinct. Eyes small, submarginal, 10 ocelli.

Epimera of segments 2–4 in ♀ demarcated.

Pleurae of pleon segments 3–5 moderately developed, acute.

Telson triangular, apically rounded.

Antenna 2, flagellum 2-jointed, 1st joint slightly shorter than 2nd.

Mandible with a single free penicil, molar penicil branched, with a short stem, outer margin without spines.

Maxilla 1, outer lobe with 4 + 4 spines, the inner ones strong, simple.

Maxilliped, inner plate with sharp point on inner distal corner, and a subterminal spine.

Peraeopods 1–5 with strong fringe of spines in ♂, 6 also more strongly spinose in ♂ than in ♀, 7 strongly dimorphic in ♂ and ♀.

Dactylar seta slender, acute.

Pleopods without pseudotracheae.

Uropod, peduncle with outer margin entire, keeled, inner ramus inserted proximally.

On referring to Budde-Lund's conspectus of the Oniscine genera (1910, p. 8 *sqq.*) this form runs down to the genera Nos. 8-13, but none of these have a "concrete" head. In side view the form of the head closely resembles that of *Sunniva* (*cf.* Budde-Lund in Voeltkow, Reise, pl. xii, fig. 2), but the margins of the first 2 peraeon segments are not cleft posteriorly. This latter character will also exclude *Saidjahus* and *Ambounia* (for the latter see Omer-Cooper, 1926, p. 352, where the name is erroneously spelt "Ambouina") among the Spherillone genera with biarticulate flagellum to antenna 2.

In general appearance this form is a Porcellionid, and the modification of the 7th peraeopod in ♂ resembles that in certain species of *Porcellio* (Sars, 1898) or *Periscyphis* (Omer-Cooper, 1926).

Krantzia poecila n. sp.

(Fig. 31.)

Surface with scattered minute scale-spines, chiefly laterally and on hind margins of segments, and on telson.

Head, front margin bluntly produced beyond level of lateral lobes, disappearing laterally above the eyes, lateral lobes rounded, a slight transverse groove behind frontal margin, front with slight median vertical ridge, concave below. Eyes small, ocelli 10.

Projecting portions of pleurae subequal to mid-dorsal length of segments, 5 not reaching to level of telsonic apex. Telson broader than long, triangular, apex broadly rounded, sides slightly concave.

Antenna 2 slender, reaching middle of peraeon segment 3, 4th joint twice 3rd, 5th not quite as long as 3rd plus 4th, flagellum shorter than 5th, its 1st joint two-thirds length of 2nd.

Peraeopods 1-5 in ♂, 4th and 5th joints with dense fringe of apically expanded spines, 6th with a few spinules and setules on inner margin; in ♀ 4th and 5th joints with few spines.

Peraeopod 6 in ♂, 4th and 5th joints with simple spines and setules on inner margin; in ♀ similar but spines less numerous.

Peraeopod 7 in ♂ stronger than the other peraeopods, 3rd joint lobed on anterior surface of the outer margin, inner apex produced in a short subacute point, 4th shorter and narrower than 3rd, its lower (inner) margin keeled, basal angle subquadrate, 5th cylindrical, longer than 4th, 6th longer and narrower than 5th; in ♀ not differing from peraeopod 6. Dactylar seta in all peraeopods slender, acute.

Pleopod 1, outer branch in ♂ ovoid, apically bluntly rounded, outer margin slightly excised apically, inner branch very stout, apex curved outwards; in ♀ outer branch transversely oblong.

Uropod, peduncle broader than long, outer margin entire, keeled, outer ramus longer than inner, which itself is slightly longer than peduncle, outer margin of outer ramus deeply grooved.

5.5 × 2 mm. (♂), 6.5 × 2.75 mm. (♀). Pale straw colour, marbled with brown or purplish brown, a medio-dorsal dark line more or less



FIG. 31.—*Krantzia poecila* n.g., n. sp. *a, b, c*, Dorsal, frontal, and lateral views of head; *d*, scale-spine; *e*, distal joints of pereopod 1 ♂, with frontal and profile views of spines further enlarged; *f, g*, 2nd-4th joints of pereopod 7 ♂ and ♀ respectively; *h*, penis and pleopod 1 ♂; *i*, outer ramus pleopod 1 ♀ (inner margin to right); *j*, 5th pleon segment and telson; *k, l*, ventral and dorsal views of uropod; *m*, cross-section of peduncle of uropod, outer margin to right.

distinct, 1st-3rd joints of antennae pale, rest brown, legs and uropods pale, eyes black.

Localities.—Natal: Krantzkop, Pietermaritzburg, and Inchanga (K. H. B., 1917).

The spines of the anterior pereopods in ♂ in an ordinary mounted preparation appear to be simply hooked, the points being deflexed proximally. When specially mounted, however, they are seen to be apically expanded, as shown in the figure. Spines of this shape have not been found as yet in any other South African woodlouse.

Hiatoniscus n.g.

Head concrete. Eyes marginal. Epimera more or less contiguous. Pleon rather broad, pleurae lamellate. Telson triangular, apically produced.

Flagellum of antenna 2 2-jointed. Mandible with 1 free penicil, molar penicil consisting of a tuft of setae. Inner spines on outer lobe of maxilla 1 bifid, inner lobe with apex scarcely wider than the bases of the 2 subequal elongate, plumose setae. Maxilla 2 with the outer apical division (representing the outer lobe) larger than inner. Maxilliped with inner plate spinulose. Peraeopods 1-3 in ♂ with rather more numerous spines than in ♀; peraeopod 1 in ♂ with large patch of spinules on anterior surface of 5th joint. Peraeopod 7 not sexually dimorphic. Dactylar seta on all peraeopods simple, acute. Five pairs of brood lamellae. Pleopods without pseudotracheae. Uropod, peduncle rather thin dorso-ventrally, and thinning to the outer edge, which is sharply keeled, and extends without bifurcation to the insertion of outer ramus, inner ramus inserted basally, longer than outer ramus.

Resembling *Oniscus* in the pleopods and uropods, but with a 2-jointed antennal flagellum. It differs, however, from both *Oniscus* and *Porcellio* in the concrete head, and the 2nd maxillae and mandibles. The uropod is remarkably like that of *Periscyphis* or *Hiallum*. The name is taken from the gaps between the epimera in the first species.

There is a superficial resemblance to *Mahehia* B-L., 1912, but the plumose setae on inner lobe of maxilla 1 constitute a decisive difference.

Key to the species.

- | | |
|--|---------------------|
| 1. Depressed, granulate, with gaps between epimera | <i>griseus</i> . |
| 2. Convex, smooth, no gaps between epimera | <i>contractus</i> . |

Hiatoniscus griseus n. sp.

(Fig. 32, a-i.)

Body subdepressed. Surface strongly granulate. Frontal margin of head forming a wide, gently convex lobe, a deep groove behind the raised edge, marginal line continuous with the lateral lobe (antennary tubercle) and fading out on the front below the frontal margin, front of the head with a slightly raised vertical ridge; eyes marginal, with about 24 ocelli.

Antero-lateral angles of peraeon segment 1 reaching nearly to

lateral lobes of head. Transverse rows of rounded tubercles in 5 series on segment 1, in 3 series on segments 2-6, and 2 series on segment 7. Anterior margins of epimera of segments 2-7 more or less obliquely bevelled off.

A single transverse row of tubercles on each of pleon segments 1-5. Telson longer than basal width, distally produced into a subacute point, 2-3 transverse rows of tubercles, but always a pair of tubercles at the base (laterally) of the apical depression or groove.

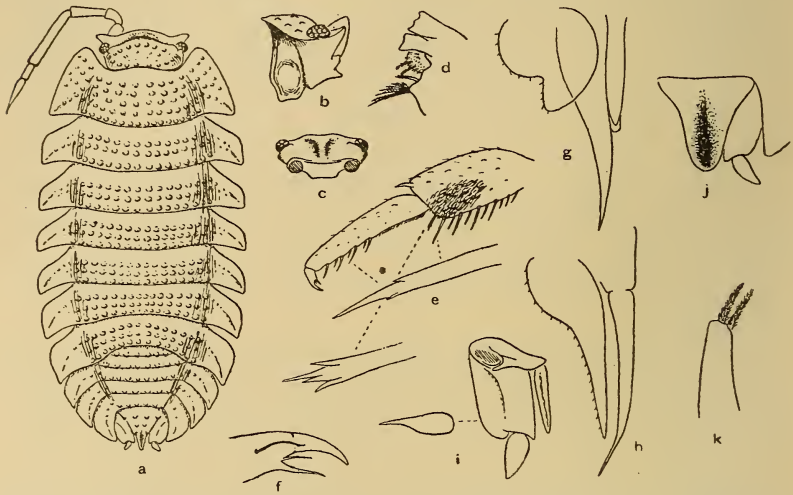


FIG. 32.—*Hyatoniscus griseus* n.g., n. sp. *a*, Whole animal; *b*, *c*, lateral and frontal views of head; *d*, apex of mandible; *e*, distal joints peraeopod 1 ♂, with spines further enlarged; *f*, dactylus of peraeopod; *g*, penis and pleopod 1 ♂; *h*, pleopod 2 ♂; *i*, dorsal view of uropod, with cross-section of peduncle, dorsal surface uppermost, outer margin to left. *H. contractus* n. sp.: *j*, telson and uropod; *k*, inner lobe of maxilla 1.

Antenna 2, 2nd joint not strongly expanded internally, 5th half as long again as 4th, flagellum shorter than 5th joint, 2nd joint nearly twice length of 1st.

Mandibles with cutting edge entire or feebly tridentate, secondary cutting edge obscurely bifid, one free penicil, molar penicil consisting of a tuft of setae. Maxilla 1, inner spines of outer lobe bifid. Maxilla 2, outer apical division larger than inner division. Maxilliped, inner plate with 2 spinules on inner and 2 on outer apex.

Peraeopods 1-3 in ♂ without a strong brush of spines, but with more spines than in ♀; peraeopod 1 with a patch of short spinules on inner anterior surface of 5th joint.

Pleopod 1 in ♂, inner branch tapering to a fine acute point, outer

branch cordiform, with outer margin excised (as in *Oniscus asellus*). Pleopod 2 in ♂, outer branch with inner angle strongly and slenderly produced.

Uropod, peduncle oblong, longer than broad, outer ramus short, subequal to width of peduncle, inner ramus inserted basally, half as long again as outer ramus.

Up to 11 × 6 mm. Slaty-grey on a semi-transparent whitish ground colour, the grey portions being chiefly the lateral parts of the peraeon and pleon, the posterior margins of the segments, tubercles, and the front of the head above insertion of the antennae, eyes black; in alcohol the whole animal, except the eyes, fades to a yellowish white.

Localities.—Cape Province: Table Mt. and Kalk Bay Mts., Cape Peninsula (K. H. B.); Hottentots Holland Mts. (K. H. B.); Zwartberg at Caledon (K. H. B.).

This species only occurs at the upper levels, in the ravines and in damp places near krantzies at the top of the mountains. It is found under stones, but prefers living under one stone resting on another rather than under stones resting directly on the ground.

Hiatoniscus contractus n. sp.

(Fig. 32, *j*, *k*.)

Body convex. Surface minutely squamulose-granulose, the lateral rugae very feebly developed. Head similar to that of *griseus*, but the epistome relatively more gibbous in consequence of its being less excavated on either side of the middle line for the reception of the 2nd antennae; lateral lobes (antennary tubercles) in dorsal view less prominent, rounded.

Epimera without any unusual intervening gaps.

Telson apically less acute than in *griseus*, rounded, dorsally with shallow median longitudinal groove almost from base to apex.

Antenna 2, flagellum with 1st joint much shorter than 2nd, scarcely more than one-quarter its length. Peraeopods rather stouter than in *griseus*. Uropod, inner ramus a little longer than peduncle and extending to apex of telson.

7 × 3 mm. Slaty-grey, with subparallel series of pale marks in the position of the lateral rugae on peraeon segments. The Riversdale specimens are more abundantly marked with paler, there being a medio-dorsal stripe and a series of marks at junctions of epimera with their segments.

Localities.—Cape Province: Langeberg Mts. at Swellendam and Riversdale, 3000–4500 ft. (K. H. B., 1925, 1926).

Except as regards the above characters this species resembles *griseus*. The peraeopods are armed in the same manner and with the same types of spines.

Gen. RHYSCOTUS B-L.

1879. *Stenomacrus*. Budde-Lund, Prosp. Gen. spec. Crust. Isop. Terr., p. 5 (nom. nud.).
 1885. *Rhyscotus*. *Id.*, Crust. Isop. Terr., p. 191.
 1905. „ Richardson, Bull. U.S. Nat. Mus., No. 54, p. 630.
 1905. *Hypergnathus*. *Id.*, *ibid.*, p. 631.
 1908. *Rhyscotus*. Budde-Lund in Voeltzkow, Reise, ii, p. 298 (conspectus spec.).
 1928. „ Jackson, Proc. Zool. Soc., i, p. 586 (morphology of head).
 1928. „ *Id.*, Quart. J. Microsc. Sci., lxxi, p. 527 (hermaphroditism).
 1930. „ Arcangeli, Boll. Lab. Zool. Portici, xxv, p. 30.

Head discrete. Epistome (Jackson: frontal lamina) strongly gibbous, separated from head by a groove.

Pleon narrower than peraeon, but not much narrower, pleurae of segments 3–5 moderate or rather small.

Telson triangular.

Antenna 2, flagellum 2-jointed, the joints subequal, or 2nd longer than 1st.

Mandible with one free penicil, molar penicil composed of a tuft of plumose setae.

Maxilla 1, outer lobe with 4 + 1 + 5 spines, one very slender spine adjoining the 4 strong outer ones, the inner 5 (or 4 of them) minutely serrate or pectinate; inner lobe with 2 subequal plumose setae.

Maxilla 2 broad at base, tapering to bilobed apex.

Maxilliped very broad, inner plate and palp reduced, the latter broad and apically rounded.

Peraeopods, anterior ones apparently not more strongly spinose in ♂ than in ♀; unguis either long and simple, or short with a vesicle below them. 7th peraeopod apparently not dimorphic.

Pleopod 1 without, pleopods 2–5 with rudimentary, pseudotracheae.

Uropod, peduncle neither channelled nor keeled on outer surface, inner ramus inserted proximally, outer ramus longer than inner.

On account of the bulbous epistome and the form of the maxilliped Budde-Lund considered that this genus should be placed in a distinct subfamily (1904, p. 36, and 1908, p. 298). The genus is known from Central and South America, West Indies, Comoro Islands, French Congo, and South West Africa. This distribution is interesting, especially as species with the long ungues and species with the short ungues and vesicles are found both in America and Africa.

Jackson has shown that the species of this genus are protandrous hermaphrodites, and that the external male genitalia are retained throughout life even in the female phase.

Rhyscotus bicolor Brnrd.

(Fig. 33.)

1924. *Rhyscotus bicolor*. Barnard, Ann. S. Afr. Mus., xx, p. 235.

1931. „ „ Brian, Rev. Suisse Zool., xxxviii, p. 435,
figs. 17-30 *bis* (var. *angolae*).

Surface regularly but somewhat sparsely granulate, on the pleon the granulation confined to the hind margins of the segments, with sometimes a faint additional transverse row across the middle of each segment. Epistome minutely rugulose.

Eyes with about 14 ocelli.

Postero-lateral angles of peraeon segments 1-3 rounded, 4 and 5 subquadrate, 6 and 7 acute.

Telson broader than long, sides strongly concave, apex acute.

Antenna 2, 5th joint longer than 4th, flagellum equal to 4th, its two joints subequal, usually the 1st slightly longer than 2nd.

Maxilla 1, only 4 (Nos. 1, 2, 3, 5) of the inner series of spines on outer lobe pectinate, the remaining one (No. 4) shorter and simple.

Peraeopods, distal margins of 3rd-5th joints with short stout close-set spines; ungues simple, long, without vesicles. Anterior peraeopods in ♂ not specially spinose, all the spines simple.

Penis widest at base, tapering evenly, the ventral surface sculptured with minute scabrosities.

Pleopod 1 in ♂, inner branch tapering to a slender point, inner margin minutely spinulose.

Uropod, peduncle oval in cross-section, distal margin externally with a small semicircular excision, inner ramus subequal to peduncle, outer ramus externally grooved.

Up to 12×4.5 mm. (δ). Slaty-grey, head and peraeon obscurely marked with more or less longitudinal light yellowish spots, postero-lateral angles of peraeon segments and the peduncle of uropod yellow, legs and 1st and 2nd joints (or 1st-3rd) of antennae pale yellow, outer branches of pleopods grey, outer ramus of uropod grey or pale yellow, eyes black. In some examples the whole of the peraeon is orange-yellow, and all gradations between the extreme colorations may occur.

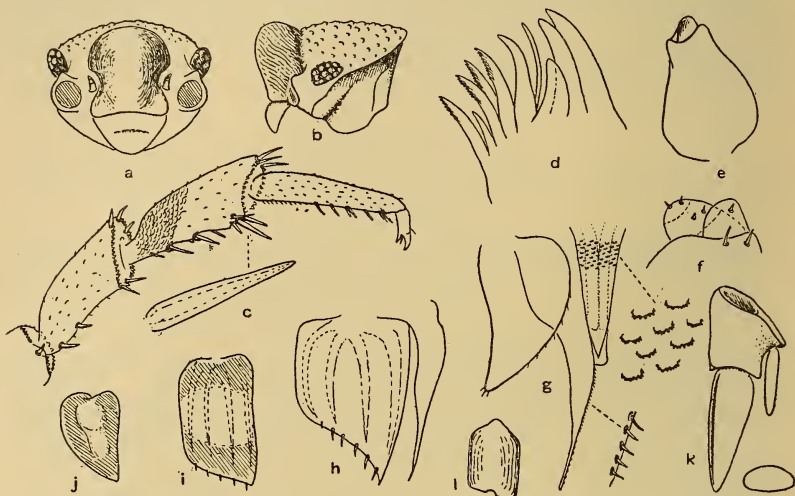


FIG. 33.—*Rhyscotus bicolor* Brnrd. *a*, *b*, Frontal and lateral views of head; *c*, distal joints peraeopod 1 δ , with spine further enlarged; *d*, apex of outer lobe of maxilla 1; *e*, maxilla 2; *f*, inner plate and palp of maxilliped; *g*, penis and pleopod 1 δ , with surface sculpturing of penis further enlarged; *h*, pleopod 2 δ ; *i*, *j*, 3rd and 5th pleopods; *k*, dorsal view of uropod, with cross-section of peduncle; *l*, outer view of peduncle of uropod.

Localities.—Ovamboland: Ongandjera and Kunene River (K.H.B.).

Kaokoveld: Warmbad and Zesfontein (R.F.L.); Kaoko

Otavi and neighbourhood (K. H. B.).

Damaraland: Belina, near Outjo (K. H. B.).

Angola: Vila da Ponte, Kubango River (Brian).

The species is common in the north-west of the Kaokoveld and Ovamboland regions of South West Africa, the most southerly and easterly locality being Outjo. Its nearest relative seems to be *globiceps* B-L. from Loango in the French Congo (fig. 39).

Of the numerous (nearly 100) specimens from the above localities all are males. Not being aware at the time of collection (Ovamboland, 1923; Kaokoveld, 1926) that the members of this genus exhibited protandry, I made no special examination of the specimens or search

for females. The largest ♂♂ are ripe, as is shown by the congealed mass of sperm on the penis and 1st pleopods, evidently squeezed out when the animals were put into alcohol.

The pseudotracheae in this species seem to be slightly different from those figured by Budde-Lund for *ortonedae* (1908, Voeltzkow, Reise, vol. ii, p. 17, figs. 24-28). On the 2nd-4th pleopods there are four tubular structures running subparallel from base to apex; on the 3rd and 4th pleopods there is an oval clear space in the middle of the appendage. In pleopod 5 there are two more or less distinct clear spaces, but no tubes. Whether these structures really are tubes, tracheal or vascular, could not be determined; the second one from the inside appears to be definitely a tube, while the others appear more like clear spaces.

FAM. ARMADILLIDIIDAE.

1885. *Armadilloidea*. Budde-Lund, Crust. Isop. Terr., p. 14.
1898. *Armadillidiidae*. Sars, Crust. Norw., ii, p. 187.
1904. *Armadillidae*. Budde-Lund, Rev. Crust. Isop. Terr., p. 96.
1910. *Armadilloidea*. *Id.*, Sjöstedt, Kilimandjaro-Meru Exp., iii, pp. 8, 9, 10.
1910. *Armadillidiidae* or *Cubaridae*. Stebbing, Gen. Cat. S. Afr. Crust., p. 444.
1922. „ Wahrberg, Ark. Zool., xv, p. 195.

First antenna 3-jointed. Second antenna, sockets usually small, flagellum 2-3-jointed. Mouth-parts as in *Oniscidae*. Penis and pleopods as in *Oniscidae*. Five pairs of brood lamellae; cotyledons present (fig. 13). Uropods exposed, but short, not extending beyond telson and pleurae of last pleon segment, outer ramus if large inserted terminally, if small usually not inserted terminally.

As *Armadillidium* Brdt. apparently precedes *Cubaris* Brdt. (see Stebbing, Willey's Zool. Res., v, p. 649, 1900), the family must unfortunately follow the longer generic name, unless the structure of the uropod is considered important enough to justify two families.

In spite of Stebbing's exposition (*loc. cit.*, 1900) of the invalidity of *Armadillo* (as the name of a Crustacean), Budde-Lund not only uses the name in 1904, but in 1909 uses it as a subgenus with type *officinalis* Desm. This subgenus therefore needs renaming. Van Name (1920, p. 97, footnote) has stated that *Cubaris* as a subgenus must be used for the "typical Old World section" of the group. But Budde-Lund

has already used *Cubaris* for the subgenus of which *murinus* Brdt. is the type. It seems, therefore, as if *Pentheus* Koch might suit for the *officinalis* section (see Budde-Lund, 1885, p. 50 and 1904, p. 97), but I do not definitely propose this as I have had access to the works of neither Brandt nor Koch.

I consider, however, that Budde-Lund's subgenera may well be elevated to the rank of genera, in spite of certain forms which appear to be somewhat transitional and thus soften the sharp lines of demarcation drawn by Budde-Lund.

For example, *aenigma* and *cingulatus* (pp. 372, 373), which in structure of the head and number of mandibular penicils are forms of *Diploexochus*, have the very broad pronotum characteristic of *Bethalus* and *Cubaris*. On the other hand *macrodens* (p. 311) is a *Bethalus* as



FIG. 34.—Apex of left mandible of: *a*, *Bethalus*; *b*, *Cubaris*; showing in the one case a single free penicil, and in the other several penicils.

regards the head and mandible, but has an unusually narrow pronotum. It seems to me that the characters of the head and mandible are likely to be of greater phylogenetic significance than the width of the pronotum, in which there is every gradation from the very narrow, almost "linear" form (e.g. *officinalis*, *formicarum*), to the very broad form (*secutor*, *aenigma*) occupying one-quarter or even one-third of the dorsal length of the segment (see fig. 75, *e*).

In the following key, therefore, the importance of the pronotum is subordinated to the characters of the head and the mandible.

The character of the epimeron of the 1st peraeon segment also shows so many transitions from the typical *Bethalus* type (thin, expanded, with small, more or less rudimentary internal tooth) to that of *Diploexochus* (more or less thickened, with the outer margin of the internal tooth continued forwards as a raised line or ridge, thus forming a more or less extensive groove between it and the actual margin), that hard and fast divisions are not possible (*cf.*, *e.g.*, the figures of *limbatus*, *barbertoni*, *macrodens*, *aenigma*, *nigricans*, *orphanus*).

The subdivision of the old "Cubaris" complex is therefore still

open to revision. But there is no doubt that the characters used by Budde-Lund are worthy of close examination, and the description of a species of "Cubaris," which omits all mention of the mandibular penicils and the pronotum, must be regarded as inadequate.

The position of some of the species described below I myself regard as unsatisfactory and subject to revision when further collecting has brought together more material.

Although included in the generic diagnoses, the groove on the anterior surface of the 5th joint of peraeopod 1 is a feature without much significance. It does not seem to have been mentioned before except by Wahrberg for *Buddelundia* (1922, p. 209), but occurs apparently throughout the family more or less conspicuously developed (*Armadillidium*, "Cubaris" *officinalis*, etc.), and in both sexes.

Key to the South African genera.

- I. The space between telson and pleura of 5th pleon segment filled by the peduncle of uropod, the outer ramus of which is narrow, terete, often very small, and inserted more or less on the internal margin of peduncle.
 - A. Telson triangular.
 - 1. Antennary tubercles combined with lateral lobes of frontal line (figs. 35, 36, 37).
 - a. Margin of peraeon segment 1 typically thickened, reflexed, and separated by a groove. Outer ramus of uropod inserted terminally *Periscyphis*.
 - b. Margin of peraeon segment 1 thin, not reflexed, not separated by a groove. Outer ramus of uropod inserted on inner margin of peduncle *Hekelus*.
 - 2. Antennary tubercles forming distinct raised ridges on epistome (fig. 38) *Exzaes*.
 - B. Telson more or less quadrangular or hour-glass shaped, apical margin broadly rounded or truncate. Antennary tubercles not distinct.
 - 1. Mandible with 1 free penicil (fig. 34, a).
 - a. Lateral marginal line of head disconnected from epistome (fig. 46). Pronotum broad, at least one-fifth (except *macrodens*) *Bethalus*.
 - b. Lateral marginal line continued on to epistome (fig. 77).
 - i. Pronotum broad.
 - a. Epimera discontinuous, margin of 1st thin
Akermania.
 - β. Epimera contiguous, margin of 1st grooved throughout its length, hind corner cleft *Synarmadillo*.
 - ii. Pronotum usually narrow.
 - a. Postero-lateral corner of peraeon segment 1 not cleft *Polyacanthus*.
 - β. Postero-lateral corner of peraeon segment 1 cleft
Diploezochus.

2. Mandible with several penicils (fig. 34, b).

a. Pronotum broad *Cubaris*.

b. Pronotum narrow *Anchicubaris*.

II. The space between telson and pleura of 5th pleon segment filled by the broad, spatulate outer ramus of uropod, attached terminally to the peduncle which is not (or scarcely) visible dorsally *Armadillidium*.

Synarmadillo Dollf. is included in the above key, as it occurs in tropical Africa and Madagascar, and has been found in the Belgian Congo (van Name, 1920). See Arcangeli, Atti Soc. It. Sc. Nat., lxvi, 1927.

Gen. PERISCYPHIS Gerst.

1873. *Periscyphis*. Gerstaecker, in von der Decken, Reise, iii, pt. 2, p. 525.
 1885. *Cercocytonus*. Budde-Lund, Crust. Isop. Terr., p. 42.
 1885. *Periscyphis*. *Id.*, *ibid.*, p. 293.
 1904. „ *Id.*, Rev. Crust. Isop. Terr., p. 37.
 1908. „ *Id.*, in Voeltzkow, Reise, ii, p. 278.
 1909. „ *Id.*, Res. Swed. Zool. Exp. White Nile, pt. 3, Terr. Isop., p. 10.
 1926. „ Omer-Cooper, Proc. Zool. Soc. Lond., p. 354 (revision of genus).
 1929. „ Arcangeli, Ann. Mus. Zool. Univ. Napoli, v, No. 23, p. 1.

Head concrete; frontal marginal line usually interrupted in middle, feeble, sometimes complete; antennary tubercles combined with frontal line. Eyes well developed.

Peraeon segment 1 with (except in two species and one n. sp. described below) margin thickened (Omer-Cooper: "girdle") and separated from rest of segment by a more or less deep groove. Postero-lateral corner entire. Margins of segments 2 and 3 not thickened either dorsally or ventrally in typical species. Pronotum broad.

Pleurae moderately or well developed. Telson triangular, sides concave, apex acute.

Antenna 1, 3rd joint not elongate, with apical tuft of setae. Antenna 2, flagellum 2-jointed, 1st joint not shorter than 2nd in typical species. Mandible with one free penicil; molar penicil a single strong, more or less branched, plumose seta. Maxilla 1, outer lobe with 4+5 (6) spines, all entire in typical species; inner lobe with 2 rather long setae. Maxilla 2 broad, inner lobe small, outer lobe much

expanded, a small lobe below latter on outer margin. Maxilliped, inner plate spinose, palp slender, not drawn out into processes.

Peraeopods 1-3 or 4 (? in all species) in ♂ with strong fringe of spines on 4th and 5th joints. Peraeopod 7 with 3rd joint often more strongly expanded on anterior margin in ♂ than in ♀.

Pleopods 1 and 2 with pseudotracheae.

Uropod, peduncle large, outer edge flattened, thin, inner ramus inserted proximally, outer ramus small or minute, often inserted subterminally on dorsal surface.

Omer-Cooper has given a very valuable revision of this genus, which is entirely African in distribution, occurring chiefly in the north-eastern region but extending southwards to Nyasaland.

The first described South African species, by an unfortunate error, was attributed to the Eubeline genus *Periscyphops*, and thus was responsible for the institution of Brian's species. It conflicts with Omer-Cooper's diagnosis in one or two points. The margins of peraeon segments 1-3 are thickened ventrally, the 2nd and 3rd only slightly; the 1st flagellar joint of antenna 2 is much shorter than the 2nd; the inner series of spines on outer lobe of maxilla 1 comprises 6 spines, 3 of which are apically notched, 3 simple, one of the latter being shorter than the rest. Peraeopods 1-4 in the ♂ are strongly fringed; this may not actually be a difference, as Omer-Cooper only mentions peraeopod 1 as being strongly fringed and says no detailed study was made of the 2nd-6th peraeopods. The spines composing these fringes are of a different shape from those of *trivialis* figured by Omer-Cooper; this may be only a specific character.

On account of the above differences it seems advisable to separate *kunenensis* from the typical species of *Periscyphis*, though it may be doubted whether the differences should be accorded more than subgeneric value.

For remarks on the brood-pouch, and an objection to Omer-Cooper's terminology, see *supra*, p. 225.

Key to the South African species.

- | | | |
|--|---|----------------------|
| 1. Antenna 2, flagellar joints subequal, or 1st longer than 2nd. | Maxilla 1, inner spines of outer lobe simple | <i>Periscyphis</i> . |
| | Girdle absent | <i>chindeensis</i> . |
| 2. Antenna 2, 1st joint much shorter than 2nd. | Maxilla 1, some of the inner spines on outer lobe trifid. | <i>Angaribia</i> . |
| | Girdle present, well developed | <i>kunenensis</i> . |

Periscyphis chindeensis n. sp.

(Fig. 35.)

Surface smooth, minutely granulate. Head with marginal line continued round lower margin of eye on to lateral lobes and across the front, but frontal line not raised or even strongly marked.

Peraeon segment 1, girdle completely absent, margin not thickened, postero-lateral corner as in *kunenensis* (fig. 36); segments 2 and 3 with margin not thickened. Pronotum $\frac{1}{2}$.

Telson broader than long, sides deeply concave, apex subacute.

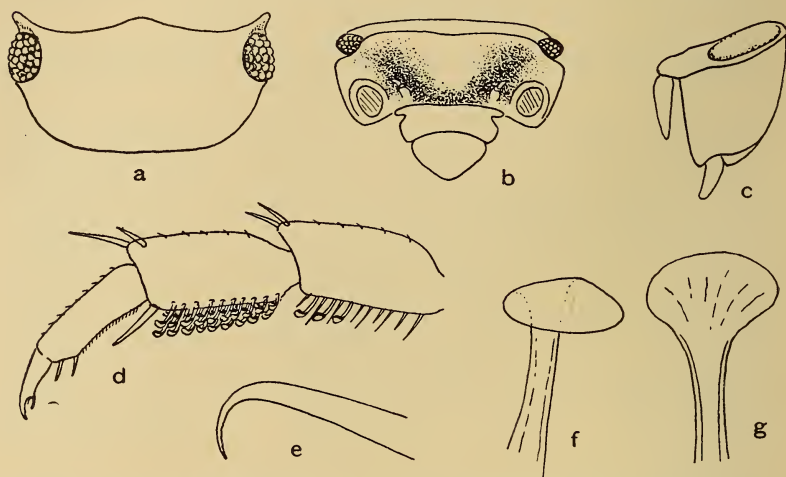


FIG. 35.—*Periscyphis chindeensis* n. sp. a, b, Dorsal and frontal views of head; c, uropod; d, peraeopod 1 ♂; e, f, g, three views of spines from 5th joint of peraeopods 1-3 ♂.

Antenna 2, 5th joint $1\frac{3}{4}$ times 4th, flagellum $\frac{3}{4}$ length of 5th joint, the two flagellar joints subequal.

Maxilla 1 typical, outer lobe with 4 + 5 spines, all the latter simple. Peraeopods 1-3 in ♂, 5th joint with strong apically expanded and hooked spines set in 3 rows on lower margin, lower apex of 4th joint also with 2-3 similar spines in peraeopods 1 and 2, but not in peraeopod 3.

Pleopod 1 ♂ as in *vittatus* Omer-Cooper.

Uropod, peduncle with basal width greater than length, inner ramus not nearly reaching inner distal angle of peduncle, outer ramus about $\frac{2}{3}$ length of inner, inserted terminally.

7.5 × 4 mm. Yellowish-white, a very faint dark median stripe

(mainly due to the gut showing through), and a series of obscure dark oval or subtriangular spots laterally (at position of junctions of epimera), one on each of peraeon segments 1-7 and pleon segments 3-5, antennae and legs pale, eyes black.

Locality.—Portuguese East Africa : Chinde, mouth of the Zambezi River (K. H. B., 1912).

The single ♂ specimen was found in the sand dunes near the shore.

In the absence of a girdle or any groove on peraeon segment 1 this species resembles *vittatus* Omer-Cooper and *civilis* B-L., but the head is like that of *latissimus* Omer-Cooper. As regards the flagellum of antenna 2 and maxilla 1 it is a typical *Periscyphis*. The most remarkable feature is the expanded and hook-like spines on the anterior peraeopods. They are so different from those of *trivialis* as figured by Omer-Cooper, and *kunenensis*, that it appears quite likely that the spines on the anterior peraeopods of the ♂ might afford specific characters ; Omer-Cooper did not specially examine this feature.

Angaribia subgen. n.

Peraeon segments 1-3 with the margins ventrally thickened.

First joint of flagellum of antenna 2 much shorter than 2nd joint. Maxilla 1, outer lobe with some of the spines of the inner series apically notched (trifid).

Peraeopods 1-4 strongly fringed in ♂ with trifid spines.

The name is taken from the Arabic : angarib, a couch, in allusion to the flat brood-lamellae on which the eggs and embryos lie, though this feature is found throughout the Armadillidiid series (*cf.* p. 225).

Periscyphis (*Angaribia*) *kunenensis* (Brnrd.).

1924. *Periscyphops kunenensis*.^{Fig. 3b} Barnard, Ann. S. Afr. Mus., xx,
p. 231.

1931. *Periscyphis monardi*. Brian, Rev. Suisse Zool., xxxviii,
p. 430, figs. 1-16 *bis*.

Surface smooth, minutely granulate. Head with marginal line continued round lower margin of eye on to lateral lobe, but not continuous across front ; front with a median vertical low rounded ridge ; limits of frontal and dorsal parts of head clearly defined, but without any actual line except immediately next the eye where there is a slight transverse impression. Upper margin of clypeus well marked, slightly notched medianly.

Girdle well developed, without any anterior depression (*i.e.* it is convex right around to the anterior margin), extending nearly to postero-lateral corner of segment; margin of segment 1 thickened ventrally as well as dorsally; antero-lateral margins of segments 2 and 3 slightly thickened ventrally. Pronotum $\frac{1}{3}$.

Telson about as broad as long, apex rounded, but not broadly, sides strongly concave.

Antenna 2, 5th joint $1\frac{1}{2}$ times 4th, flagellum shorter than 5th joint, its 1st joint one-half length of 2nd.

Maxilla 1, three (Nos. 1, 3, 4) of the six spines of inner series on outer

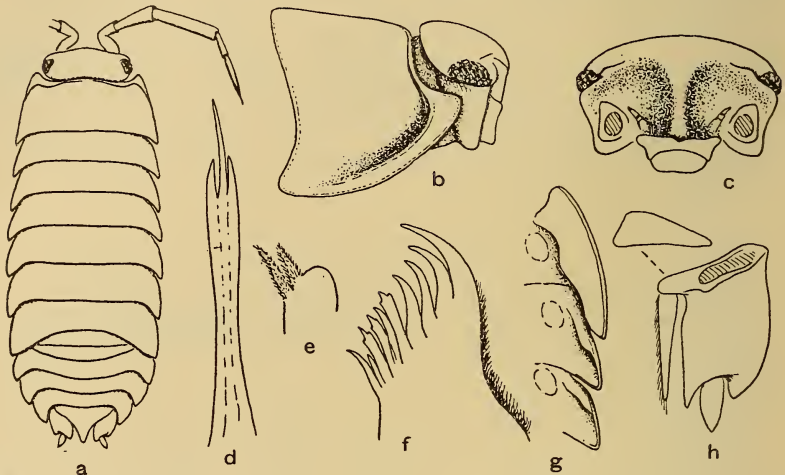


FIG. 36.—*Periscyphis* (subgen. *Angaribia* n.) *kunenensis* (Brnd.). *a*, Whole animal; *b*, side-view of head and peraeon segment 1; *c*, front view of head; *d*, spine from peraeopod 1; *e*, *f*, apices of inner and outer lobes of maxilla 1; *g*, ventral surface of peraeon segments 1-3; *h*, dorsal view of uropod, with cross-section of peduncle, dorsal surface above, outer margin to right.

lobe apically notched, trifid, the 5th spine shorter than the others; inner lobe with outer distal angle rather strongly rounded. Maxilla 2 and maxilliped as in Omer-Cooper's figs. 10-12.

Peraeopods 1-4 ♂, 4th and 5th joints strongly spinose, the spines apically trifid, the median point much longer than the others.

Pleopod 1 ♂ as in *undulata*, Omer-Cooper's fig. 41. Pseudotracheae on pleopods 1 and 2 very rudimentary.

Uropod, peduncle longer than broad, inner distal angle projecting beyond outer angle, inner ramus extending nearly to inner distal angle of peduncle, outer ramus terminal, one-half length (or nearly) of inner ramus.

Up to 10-11 × 4 mm. (♂♂ smaller than ♀♀). Slaty-grey with faint lighter marks dorsally, arranged more or less in two series, usually a pale spot laterally on each peraeon segment at position of junctions of epimera, legs and first 3 joints of antennae pale, uropods pale orange, eyes black.

In the Kaokoveld specimens the dorsal light marks are more or less confluent into large light patches; in some specimens the light colour predominates, but the pleon is nearly always uniformly dark, though the pleurae of segment 5 are pale sometimes. There is one completely pale (albino) ♀ from Kaoko Otavi, even the eyes being brown instead of black.

Localities.—Ovamboland: Kunene River and Mafa (Barnard).

Kaokoveld: Kamanyab and Kaoko Otavi (K. H. B., 1926).

Angola: Vila da Ponte, Rio Mbalé, Kubango River (Brian).

This species has several points of likeness to the Abyssinian *undulata* Omer-Cooper, thus the girdle, shape of telson, uropods, and pleopod 1 in ♂.

The Kaokoveld specimens are larger and more strongly mottled than those collected in Ovamboland.

Hekelus n.g.

Head concrete; lateral marginal line continued past eyes on to lateral lobes of frontal line, which in front view is strongly declivous laterally, and interrupted in middle by a raised cuneiform narrow shield. Antennary tubercles combined with lateral lobes of frontal line.

Epimera contiguous, margin of 1st thin, not reflexed. Hind margin of peraeon segment 1 sinuous. Pronotum very broad. Pleon rather narrow. Telson triangular.

Antenna 2 with 2-jointed flagellum. Mandible with a single free penicil. Maxilla 1 with some of the inner spines on outer lobe bifid, inner lobe apically scarcely wider than the bases of the 2 subequal slender and elongate plumose setae. Maxilliped with spinulose inner plate, and palp without setose processes.

Peraeopod 1 with groove on anterior surface of 5th joint.

Uropod, peduncle broad, proximally, apically narrowing, outer ramus cylindrical, rather stout, inserted on inner margin, inner ramus long.

The head seems to bear most resemblance to that of *Scleropactes* (Jackson, 1928, fig. 16), one of the Spherillonine genera. There is a certain similarity to *Adinda* B-L. (of which *Paraperiscyphis* Stebb. is a synonym) in the uropod, but the maxilliped has no setose processes on the palp.

Hekelus episimus n. sp.

(Fig. 37.)

Body rather narrow, strongly convex. Surface minutely granulate. Rugae distinct. Head strongly convex dorsally, with 2 shallow grooves from posterior margin converging forwards and petering out

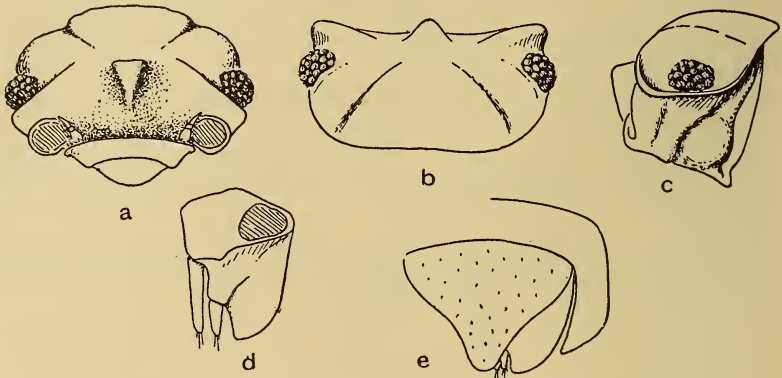


FIG. 37.—*Hekelus episimus* n.g., n. sp. a, b, c, Frontal, dorsal, and lateral views of head; d, dorsal view of uropod; e, telson.

before reaching the projecting cuneiform process on epistome. Eyes rather large, 18–20 ocelli.

Peraeon segment 1 with epimeral margin thin, subvertical, not reflexed. No internal lamina or tooth on either segment 1 or 2.

Pronotum of segment 2 one-third, of posterior segments nearly one-half the dorsal length of segment.

Pleon rather narrow, pleurae slender. Telson triangular, broader than long, apex narrowly rounded, dorsally unsculptured, strongly convex proximally, less so distally.

Antenna 2, 2nd joint slightly broader and shorter than 4th, 5th $1\frac{1}{2}$ times 4th, flagellum equal to 4th joint, its 2nd joint 2– $2\frac{1}{2}$ times 1st.

Tracheal areas on pleopods small.

Uropod, peduncle oblong, stout proximally, narrowing distally to an asymmetrically rounded apex which projects beyond apex of pleurae of pleon segment 5, outer ramus extending almost to apex

of peduncle, inner ramus long, extending to level of apex of outer ramus and almost to apex of telson.

7 × 2.75 mm. Dark slaty-grey, sometimes, especially in young, with a series of paler spots at junctions of epimera, eyes black, antennae and legs slaty-grey.

Localities.—Cape Province: Table Mt. and Kalk Bay Mt., Cape Peninsula (K. H. B.); Noordhoek Forest, Cape Peninsula (K. H. B.).

The Noordhoek Forest (altitude 500 ft.) specimens have a more narrowly pointed telson, and are definitely mottled; but otherwise they are not distinguishable from the specimens from higher altitudes.

This woodlouse lives amongst leaves and humus in the forest and bush-filled kloofs on the mountain slopes.

Exzaes n.g.

Head concrete; antennary tubercles forming distinct ridges over the antennal sockets; epistome with a median triangular raised shield.

Peraeon segment 1 with epimeral margin reflexed, hind corner cleft. Segment 2 with ridge on lower surface near anterior margin, but no tooth. Pronotum very broad. Telson triangular.

Antenna 2 with 2-jointed flagellum. Mandible with a single free penicil. Maxilla 1 with 9 spines on outer lobe, 3 or 4 of the inner ones feebly bifid, inner lobe with 2 slender subequal plumose setae, outer apex of lobe rounded.

Peraeopod 1 with feeble groove on anterior surface of 5th joint.

Uropod, peduncle oblong, outer ramus well developed, cylindrical, inserted dorsally near inner margin, inner ramus long.

This genus closely resembles *Armadillidium* in the structure of the head (*cf.* Jackson, 1928, p. 592, fig. 19), but the upper margin of the median shield is continuous with the frontal line, which meets the eye but does not form projecting lateral corners in front of the eye.

Both the species described below live in the bush and forest in sheltered (εξ-ζαης) kloofs of the mountains.

Exzaes sylvatica n. sp.

(Fig. 38, a-g.)

Surface strongly squamulose, scale-spines triangular, broad and short. Rugae obsolete. Eyes with 9-10 ocelli.

Peraeon segment 1, margin reflexed, slightly costate, not grooved, hind corner unequally cleft. Segment 2, epimeron with a distinct

rounded ridge, but no projecting or free tooth. Pronotum of segment $2\frac{2}{3}-1\frac{1}{3}$, of posterior segments $\frac{1}{2}-\frac{2}{3}$ of dorsal length.

Telson slightly broader than long, sides slightly concave, apex subacute, dorsally smoothly convex, no median ventral groove.

Antenna 2, 2nd and 4th joints subequal, 5th $1\frac{1}{2}$ times 4th, flagellum three-quarter length of 5th, its 2nd joint 3-4 times 1st.

Uropod, peduncle longer than wide, outer distal corner rounded, outer ramus extending to apex of peduncle, inner ramus long, projecting a little distance beyond telsonic apex.

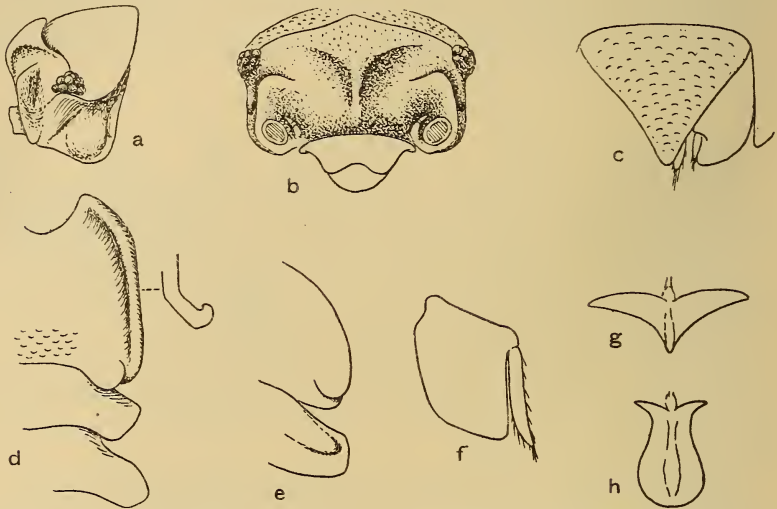


FIG. 38.—*Exzaes sylvatica* n.g., n. sp. a, b, Lateral and frontal views of head; c, telson; d, dorsal view of peraeon segments 1-3; e, ventral view of peraeon segments 1 and 2; f, ventral view of uropod; g, scale-spine. *Exzaes bicolor* n. sp.: h, scale-spine.

Tracheae occupying one-third (at most) of the pleopods.

5×2 mm. Pale slaty-grey, uniform, eyes black.

Localities.—Cape Province: Knysna Forest (J. D.); George Forest (K. H. B.).

Exzaes bicolor n. sp.

(Fig. 38, h.)

Distinguished from *sylvatica* as follows: eyes larger, with 12-14 ocelli, scale-spines obovate, longer than wide, apically rounded, and coloration.

9×3.5 mm. Slaty-grey, mottled with dull orange or yellowish, head almost always orange or yellow, rarely suffused medio-dorsally,

eyes black, legs pale greyish, peduncle of antennae grey, flagellum white.

Locality.—Cape Province: Oudebosch Forest, River Zonder End Mts. (K. H. B.).

Gen. BETHALUS B-L.

1904. *Armadillo* (part). Budde-Lund, Rev. Crust. Isop. Terr., pp. 97, 127 (Section vii).
 1900. " " *Id.*, in Voeltzkow, Reise, ii, p. 275.
 1909. *Bethalus*. *Id.*, in Schultze, Reise, ii, p. 54 (subgen. of *Armadillo*).
 1910. " *Id.*, Sjöstedt, Kilimandjaro-Meru Exp., iii, p. 12.

Head concrete, antennary tubercles not distinct, epistome without median raised shield, but separated from dorsal surface of head by a



FIG. 39.—Chart showing the recorded distribution of the following genera. *Tylos* indicated by thickened coast-line, *Deto* by cross-lines on the coast, *Rhyscotus* by ●, *Periscyphis* by ▲. *Bethalus* occurs east of the broken line, and also in Madagascar. *Niambia* occurs west of the dotted line; the subgenus *Manibia* occurs in two localities marked by ■.

more or less deep groove, lateral marginal line not continued on to epistome (fig. 46).

Epimera large and thin; on segment 1 reflexed, not grooved, hind corner not cleft; internal tooth or fold usually small, often very small, tooth on segment 2 sometimes obsolete. Hind margin of segment 1 sinuate.

Pronotum occupying at least $\frac{1}{3}$ of dorsal surface (except in *macrodens*).

Antenna 2 with 2-jointed flagellum. Mandible with a single free penicil. Maxilla 1, inner lobe with 2 slender subequal plumose setae, outer apex rounded.

Peraeopod 1 with groove on anterior surface of 5th joint.

Uropod, peduncle oblong, subquadrate, or subtriangular, inner and outer rami well developed, both cylindrical.

Genotype: *nigrinus* B-L.

In 1909 Budde-Lund excluded *emunitus* (from Siam) from his Section vii. If we exclude also *tenuipunctatus* and *depressus* (both from St. Vincent, W.I.), which Budde-Lund doubtfully placed in this section in 1904, the genus is seen to be confined to South Africa and Madagascar. In Budde-Lund's MSS. in the British Museum four more Madagascan species are included in the genus.

The distribution in South Africa (fig. 39) is interesting in comparison with that of the allied Cubarid genera.

Key to the South African species.

- I. Epistome not strongly raised above dorsal level of head (fig. 43). Postero-lateral corner of peraeon segment 1 rounded.
 - A. Internal tooth on peraeon segment 2 small, usually not extending to margin.
 1. Telson coarctate.
 - a. Inner ramus of uropod short.
 - i. Telson with two tubercles and a median keel *limbatus*.
 - ii. Telson nearly smooth.
 - a. Without rugae. Tooth on segment 2 very small *pretoriensis*.
 - β. With rugae. Tooth on segment 2 larger *rhodesiae*.
 - b. Inner ramus of uropod long *panurus*.
 2. Telson not or scarcely coarctate.
 - a. Telson with 2 tubercles at base of median keel . *cordatus*.
 - b. Telson without tubercles at base.
 - i. Telson medianly keeled.
 - a. Distal portion of telson longer than wide *nigrinus*.
 - β. Distal portion of telson at least as wide as long *tradouwi*.
 - ii. Telson smooth *stricticauda*.

B. Internal tooth on segment 2 stronger.

1. Tooth on segment 2 not extending to antero-lateral margin. Internal lamina on segment 1 strong *macrodens*.
2. Tooth on segment 2 extending to margin, and partially visible externally in lateral view *barbertoni*.

II. Epistome strongly raised (fig. 46). Postero-lateral corner of segment 1 subtruncate.

A. Peraeon segments without medio-dorsal posterior processes.

1. Peduncle of uropod not narrowed distally, filling up the space between telson and pleura of 5th pleon segment *mucidus*.
2. Peduncle of uropod strongly narrowed apically, leaving a gap between telson and 5th pleon segment *warreni*.

B. Peraeon segments with medio-dorsal pointed process on hind margin of at least one segment.

1. Processes on all segments *secutor*.
2. A short process on 7th segment only, or on 6th and 7th *barnardi*.

Bethalus limbatus (Brdt.).

(Fig. 40, a-c.)

- | | | |
|-------|-----------------------------|---|
| 1833. | <i>Cubaris limbata</i> . | Brandt, Conspect., xxviii, p. 4,
pl. iv, fig. 18. |
| 1885. | <i>Armadillo limbatus</i> . | Budde-Lund, Crust. Isop. Terr.,
p. 39. |
| 1895. | „ <i>griseo-albus</i> . | Dollfus, Mem. Soc. Zool. Fr., viii,
p. 347, fig. 5. |
| 1904. | „ <i>limbatus</i> . | Budde-Lund, Rev. Crust. Isop.
Terr., p. 128, pl. x, fig. 33. |

Surface minutely granulate (the apparent granulation really formed by minute transverse impressions). Rugae on head and peraeon segments feeble. Epistome not strongly raised.

Peraeon segments 1 and 2 both with feeble internal tooth. Segment 7 very slightly thickened below (Budde-Lund).

Telson a little broader than long, apical margin convex, sides incurved, dorsally with 2 rounded tubercles at base, followed by a low median ridge; a feeble median impression ventrally.

Antenna 2 slender, 2nd joint of flagellum 3-4 times length of 1st.

Uropod, peduncle subquadrangular, outer ramus short, inner ramus short, $1\frac{1}{2}$ times length of outer ramus, extending scarcely midway to apex of telson.

10 x 5 mm. Slaty grey, with pale flecks dorso-laterally; sometimes variously mottled, the epimera and especially the pleurae often pale; uropods usually orange or dull reddish.

Localities.—Cape Province: Cape Town and Port Elizabeth (Budde-Lund); Matjesfontein (Dollfus, also W. F. P. and R. M. L.); Port Elizabeth (S.A. Mus., per J. L. Drege); Zwartkops, near Port Elizabeth (K. H. B.); Uitenhage (K. H. B.); Addo Bush (J. D.); Vogelfontein, Prince Albert Div. (A. J. H.); Drieling's Kloof, between Laingsburg and Ladismith (K. H. B.); Beaufort West (W. F. P.); Victoria West (A. H. H.); De Aar (W. F. P.); Naauwpoort (W. F. P.); Hanover (W. F. P.); Cradock (W. F. P.); Laingsburg (W. F. P.); Montagu (W. F. P.); Knysna (R. M. L.); Mossel Bay (W. F. P.); Zwartberg Pass, Prince Albert (W. F. P.); Seven Weeks Poort and Meiringspoort, Zwartberg Range (K. H. B.); Doorn River, north of Montagu Pass, Oudtshoorn Dist. (S. H. H. and C. T.); Richmond (L. D. B. and C. T.); Fort Brown (Albany Mus.); Rosmead (Albany Mus.); Grahamstown (Albany Mus.).

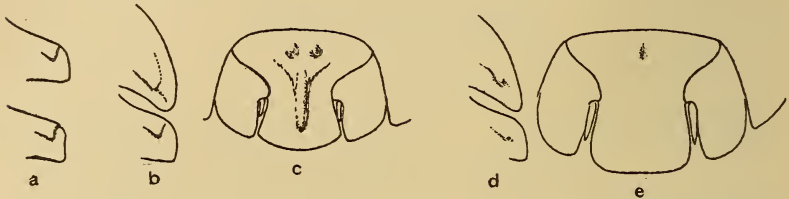


FIG. 40.—*Bethalus limbatus* (Brdt.). *a*, Two varieties of internal tooth on epimeron 2; *b*, ventral view of epimera 1 and 2; *c*, telson and uropods. *B. pretoriensis* (Dollf.): *d*, ventral view of epimera 1 and 2; *e*, telson and uropods.

Although there appears to be an appreciable difference in the figures of the telson given by Budde-Lund and Dollfus, *griseo-albus* seems to be undoubtedly synonymous with *limbatus*. I have compared Port Elizabeth specimens sent to the South African Museum by J. L. Drege with Budde-Lund's specimen in the British Museum, and have also examined numerous specimens from Matjesfontein, the type locality of *griseo-albus*. Dollfus says the length of the telson is greater than its width, but his figure shows the length exactly equal to the (visible) width. Normally the length is slightly less than the width, but not quite so much less as in Budde-Lund's figure.

In all the specimens I have seen, even those from Port Elizabeth, the fold (Budde-Lund: *duplicatura*) on the under side of the 7th epimeron is obsolete; perhaps Budde-Lund is referring to the faint longitudinal (*i.e.* parallel with lateral margin) ridge found on the under side of the 3rd-7th epimera in many species (*cf.* fig. 46, *mucidus*).

The Knysna specimens differ slightly in having the internal teeth on segments 1 and 2, especially that on segment 1, rather more

strongly developed; that on segment 1 is flanked on the outside by an indication of a thickening similar to that in *barbertoni* (fig. 45), but less conspicuous. In other respects the specimens are typical.

In some specimens, chiefly among those from the more northeasterly localities (e.g. Victoria West, Richmond), the tooth on segment 2 extends to the antero-lateral margin, or even overlaps it very slightly, as in *barbertoni* (fig. 45).

When identifying specimens reference should be made to *Diploexochus disjunctus*, which at first sight is very similar in appearance.

Bethalus pretoriensis (Dollf.).

(Fig. 40, d, e.)

1895. *Armadillo pretoriensis*. Dollfus, Mem. Soc. Zool. Fr., viii, p. 348, fig. 7.

1904. „ „ Budde-Lund, Rev. Crust. Isop. Terr., p. 130, pl. x, fig. 34.

Surface minutely granulate. Rugae indistinct. Epistome not strongly raised, in front view with a faint median V-shaped impression above, bounded below by a more or less distinct ridge.

Peraeon segments 1 and 2 with small internal teeth. Segments 5-7 not thickened on under surface.

Telson as long as basal width or a little longer, sides slightly incurved, apical margin almost straight, dorsally smooth with a very slight and inconspicuous median impression near base; ventrally with median groove.

Antenna 2 slender, 2nd joint of flagellum 3-4 times length of 1st.

Uropod, peduncle distally subquadrate, outer angle bevelled off, outer ramus moderately long, inner ramus a little longer than outer ramus, extending midway, or a little farther, to apex of telson.

8 × 4 mm. Grey, mottled laterally, with margins of peraeon and pleon often pale reddish, uropods red.

Localities.—Transvaal: Pretoria (Dollfus); Johannesburg and Modderfontein (W. F. P.); Junction of Marico and Crocodile Rivers (R. W. E. T.).

Bechuanaland: Vryburg (Dollfus).

Bethalus rhodesiae n. sp.

(Fig. 41, a, b.)

Surface minutely granulate. Rugae distinct. Epistome not strongly raised, with a shallow V-shaped median impression above.

Internal tooth on segment 1 small; that on segment 2 larger, extending nearly but not quite to antero-lateral margin, and not visible in external view. Segments 5-7 not thickened below.

Telson a little broader than long, apical margin slightly convex, sides incurved, dorsally with very faint median elevation; ventrally with median groove in basal half.

Antenna 2 moderately slender, 2nd joint of flagellum 3-4 times 1st. Uropod, peduncle apically subquadrate, outer ramus extending a little



FIG. 41.—*Bethalus rhodesiae* n. sp. a, Ventral view of epimera 1 and 2; b, telson and uropods. *B. panurus* (B-L.); c, telson and uropods, from Budde-Lund's type of specimen in the British Museum.

more than half-way to apex of peduncle, inner ramus a little more than half length of peduncle, extending $\frac{2}{3}$ distance to apex of telson.

6 × 2.5 mm. In alcohol dark slaty-brown, uropods light (probably red in life).

Localities.—Rhodesia: Umtali (S.A. Mus.); Bulawayo and Salisbury (R. W. E. T.); Sanyati Valley (S.A. Mus.).

Distinguished from *pretoriensis* by the tooth on segment 2 and the more distinct rugae; and from *barbertoni* by the teeth on both segments 1 and 2.

Bethalus panurus (B-L.).

(Fig. 41, c.)

1904. *Armadillo panurus*. Budde-Lund, Rev. Crust. Isop. Terr., p. 131.

Surface minutely granulate. Rugae obsolete. Epistome not strongly raised, very faintly impressed medio-dorsally.

Internal tooth on segment 1 small and feeble; that on segment 2 almost obsolete.

Telson scarcely broader than long, apical margin slightly convex, sides slightly incurved, dorsal surface smoothly convex.

Uropod, outer ramus extending nearly to apex of peduncle, which

is obtusely rounded, inner ramus long, extending almost to apex of telson.

7 × 3.3 mm.

Locality.—Natal (Budde-Lund).

The obsolete rugae and smoothly convex telson are included in the above description from an inspection of Budde-Lund's type in the British Museum. I have seen no other examples.

Bethalus cordatus (Dollf.).

(Fig. 42.)

1895. *Armadillo cordatus*. Dollfus, Mem. Soc. Zool. Fr., viii, p. 349, fig. 8.

1904. " " Budde-Lund, Rev. Crust. Isop. Terr., p. 129.

Surface granulate. Rugae distinct, forming on each peraeon segment a continuous transverse series. Epistome not strongly raised, with 2 granules bordering a shallow median impression.

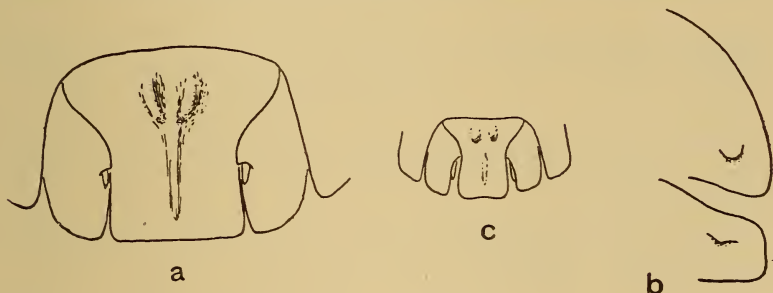


FIG. 42.—*Bethalus cordatus* (Dollf.). *a*, Telson and uropods of East London specimens; *b*, ventral view of epimera 1 and 2 of East London specimens; *c*, telson and uropods of Bloemfontein specimen (after Dollfus).

Internal teeth on segments 1 and 2 small, that on segment 2 obscure.

Telson slightly broader than long or about as broad as long, sides scarcely incurved, apical margin straight (in Dollfus' figure slightly concave), dorsally with 2 strong longitudinally elongate tubercles near base followed by a median longitudinal keel.

Antenna 2, 2nd joint of flagellum 3 times 1st.

Uropod, peduncle subquadrangular, but outer distal angle rounded, outer ramus short, extending $\frac{1}{3}$ distance to apex of peduncle, inner ramus extending $\frac{1}{2}$ – $\frac{2}{3}$ distance to apex of telson.

Up to 7×3 mm. (Dollfus : 4×1.75 mm.). In alcohol, grey-brown, uropods red.

Localities.—Orange Free State : Bloemfontein (Dollfus).

Cape Province : East London (R. M. L.).

The East London specimens are so like Dollfus' description and figure that I think they must be identified with his species ; they differ in the slightly shorter telson and the outer ramus of uropod.

Bethalus nigrinus (B-L.).

(Fig. 43, a, b.)

- | | | | |
|-------|------------------------------|--------------|---|
| 1885. | <i>Armadillo nigrinus</i> . | Budde-Lund, | Crust. Isop. Terr., |
| | | | p. 37. |
| 1904. | „ „ | <i>Id.</i> , | Rev. Crust. Isop. Terr., p. 131, |
| | | | pl. x, figs. 35, 36. |
| 1917. | <i>Cubaris reticulatus</i> . | Collinge, | Ann. Nat. Mus., iii, p. 570, |
| | | | pl. xl, figs. 11-21. |
| 1920. | „ „ | <i>Id.</i> , | <i>ibid.</i> , iv, pl. xxvii, fig. 2 (figure |
| | | | shows 8 peraeon segments). |
| 1917. | <i>Cubaris longicauda</i> . | <i>Id.</i> , | <i>ibid.</i> , iii, p. 574, pl. xli, figs. 21-31. |
| 1920. | „ „ | <i>Id.</i> , | <i>ibid.</i> , iv, pl. xxvii, fig. 5 (figure |
| | | | shows only 6 peraeon segments). |

Surface minutely granulate. Rugae moderately distinct but not strong. Epistome not strongly raised, evenly convex, slightly sloping backwards above.

Internal teeth on segments 1 and 2 very small and inconspicuous, mere granules. Segments 5-7 not transversely thickened below.

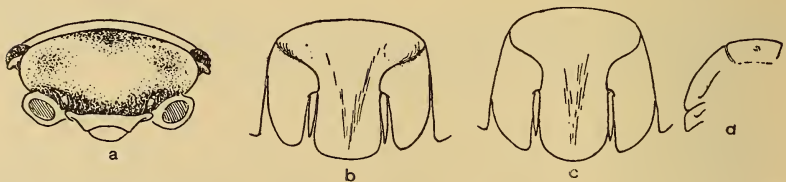


FIG. 43.—*Bethalus nigrinus* (B-L.). a, Front view of head ; b, telson and uropods. *B. stricticauda* (Dollf.) : c, telson and uropods from specimen in Budde-Lund collection in British Museum ; d, ventral view of epimera 1 and 2, after Dollfus.

Telson scarcely broader than long, distal portion subrectangular, longer than broad, apical margin slightly convex, sides scarcely incurved, dorsally with slight median longitudinal ridge or keel ; ventrally with median groove.

Antenna 2, 2nd joint of flagellum 2-3 times 1st.

Uropod, peduncle narrowing distally, apex narrowly rounded, not always completely filling the space between telson and 5th pleon segment, outer ramus rather long, but not quite reaching apex of peduncle, inner ramus long, scarcely reaching apex of telson.

Up to 12-14 × 6-7 mm. Slaty-grey, or brownish, often more or less reticulated, with pale dorso-lateral flecks, or mottled, epimera and uropods often pale.

Localities.—Cape Province: Cape Town and Port Elizabeth (Budde-Lund); Pondoland (Budde-Lund MSS.); Port Alfred (Collinge, and Albany Mus.); East London (W. F. P. and R. M. L.); Port St. Johns (S.A. Mus.); Grahams-town (W. F. P., and Albany Mus.); Fort Brown (Albany Mus.); Amatola Mts. (W. F. P.); Knysna (W. F. P. and R. F. L.); Keurbooms River (K. H. B.); Wilderness, near George (S. H. H. and C. T.); Kaai-mansgat, near George (K. H. B.); Pacaltsdorp (S.A. Mus.); Bredasdorp (R. F. L.).

Natal: Pietermaritzburg (Collinge); Durban, Inchanga, and Krantzkop (K. H. B.); Port Edward, near Port Shepstone (Natal Mus.); M'fongosi, Zululand (S.A. Mus.).

Portuguese East Africa: Masiene (R. F. L.).

In 1885 Budde-Lund gave the locality as "Cape of Good Hope" with a query, probably collected by Drege; in 1904 he gave the above more exact localities without, however, indicating the source of his new material (if it was new material). I very much doubt the occurrence of the species anywhere near Cape Town.

The distal portion of the telson is often slightly broader than in Budde-Lund's 1904 figure, and the peduncle of uropods is broader, filling up nearly the whole space between the telson and 5th pleon segment. I have seen an example from Port Alfred, and find the anterior "raised lateral bosses" mentioned by Collinge are non-existent; the deceptive appearance as shown in Collinge's fig. 31 is due to a couple of pale spots.

There is some slight variation in the width of the distal portion of the telson, even in specimens from the same locality, and the keel on the telson tends to be sharper and more distinct in examples from the eastern localities than in those from the western districts. But no hard and fast distinction can be found sufficient to justify keeping

either *reticulatus* or *longicauda* as a variety. Budde-Lund's figure does not show the keel on the telson.

As far as can be judged from the present known localities, this species appears to be a coastal species, though it occurs inland at Grahamstown and the Amatola Mts. At Keurbooms River and the localities near George it is found under logs and in the bush on the sand-dunes bordering the shore.

I have seen specimens labelled *reticulatus* in Collinge's handwriting from the type locality *ex* Natal Museum. They prove to be indistinguishable from *nigrinus* (and *longicauda*!), and show that Collinge's figs. 18 and 21 have been badly executed. The internal tooth on segment 1 is represented as too large and too near the lateral margin, and the apical portion of the telson as too stumpy.

Bethalus tradouwi n. sp.

(Fig. 44, d, e.)

Surface minutely granulate. Rugae moderately distinct. Epistome not strongly raised.

Epimeral margin of segment 1 reflexed, under-surface tumid but not so strongly as in *macrodens*, internal tooth moderate, traceable to about half-length of lateral margin. Internal tooth on segment 2 strong, nearer anterior margin than in *macrodens*.



FIG. 44.—*Bethalus macrodens* n. sp. a, Telson and uropods; b, marginal view of epimeron 1; c, ventral view of epimera 1 and 2. *B. tradouwi* n. sp.: d, ventral view of epimera 1 and 2; e, telson and uropods.

Telson broader than long, distal portion broader than long, sides not incurved, apical margin straight, dorsally with slight median ridge.

Antenna 2, 2nd joint of flagellum 4 times 1st.

Uropod, peduncle narrowing distally, outer ramus extending half-way to apex of peduncle, inner ramus extending half-way to apex of telson.

6 × 3 mm. Slaty-grey, variegated with lighter.

Localities.—Cape Province : Langeberg Mts. at Tradouw Pass and Riversdale (K. H. B.).

As regards the internal tooth on segment 1 this species occupies a position intermediate between *limbatus* and *macrodens*, but the quadrangular distal portion of the telson is distinctive.

Bethalus stricticauda (Dollf.).

(Fig. 43, c, d.)

1895. *Armadillo stricticauda*. Dollfus, Mem. Soc. Zool. Fr., viii, p. 348, fig. 6.

1904. „ „ „ „ Budde-Lund, Rev. Crust. Isop. Terr., p. 132, pl. x, figs. 37, 38.

Epistome not strongly raised, with a low median tubercle.

Internal teeth on segments 1 and 2 small.

Telson longer than wide, distal portion longer than wide, sides slightly incurved, apical margin slightly convex.

Antenna 2, 2nd joint of flagellum 3 times 1st.

Uropod, peduncle subquadrangular, filling space between telson and 5th pleon segment, outer ramus reaching nearly to apex of peduncle, inner ramus long, extending to apex of telson.

9 × 4 mm. Grey-brown, lighter at sides, uropods red.

Locality.—Transvaal : Makapan Caves (Dollfus).

This species is very near to *nigrinus*, differing in the more rounded apex of the telson and the slightly wider (less narrowed) apex of peduncle of uropod.

Bethalus macrodens n. sp.

(Fig. 44, a-c.)

Surface minutely granulate. Rugae distinct, forming on each segment a transverse series of rounded but rather conspicuous tubercles, continuous across the middle line. Epistome not strongly raised.

Epimeral margin of segment 1 strongly reflexed so that under surface is strongly tumid, the actual margin thin, internal tooth large, its outer margin traceable almost to antero-lateral corner of segment. Internal tooth on segment 2 strong but slender, in the middle of the epimeron, not adjacent to anterior margin.

Pronotum on segment 2 one-eighth, becoming on posterior segments one-sixth.

Telson very slightly broader than long, sides incurved, apical

margin almost straight, dorsally with 2 rather conical tubercles near base, and a more longitudinally elongated median tubercle about at level of insertion of outer rami of uropod.

Antenna 2, 2nd joint of flagellum 3 times 1st.

Uropod, peduncle narrowing distally, but apex subquadrate, outer ramus moderate, extending half-way to apex of peduncle, inner ramus short, twice as long as broad, extending one-quarter distance to apex of telson.

10 × 5 mm. Slaty-grey, mottled with paler.

Locality.—Cape Province: Groot Vaders Bosch, Langeberg Mts., near Heidelberg (K. H. B.).

In general appearance (thin and strongly reflexed epimeral margin of 1st segment) and structure of head this species is a *Bethalus*, but it has an unusually narrow pronotum, especially on segment 2. A further transition to *Diploexochus* is shown in the indication of a groove parallel to, but some little distance removed from, the margin of 1st segment. It resembles somewhat *limbatus* as regards the telson, but the teeth on segments 1 and 2 are quite distinctive.

Bethalus barbertoni n. sp.

(Fig. 45.)

Surface minutely granulate. Rugae obsolete. Epistome not strongly raised.

Internal tooth on segment 1 rather small, flanked on outside by a rounded thickening, without, however, any groove between it and the

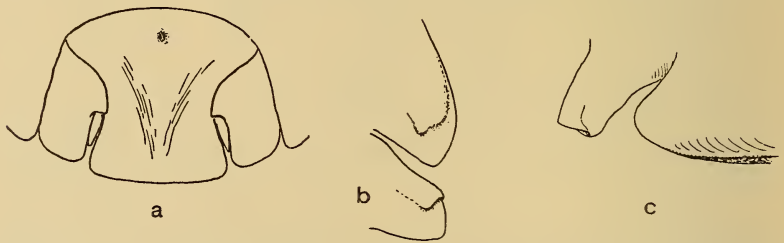


FIG. 45.—*Bethalus barbertoni* n. sp. a, Telson and uropods; b, ventral view of epimera 1 and 2; c, external lateral view of epimera 1 and 2.

margin; that on segment 2 rather well developed, forming a flap which extends to anterior margin, and is visible from outside in lateral view. Epimera of segments 5–7 with slight transverse thickenings below.

Telson a little broader than long, apical margin slightly convex, sides incurved, dorsally smooth, with a small shallow median pit near base (obscure in juveniles); ventrally with median groove at base.

Antenna 2 rather stout, flagellum distinctly more slender than peduncle, 2nd joint 3 times 1st.

Uropod, peduncle apically subquadrate, outer ramus not reaching apex of peduncle, outer inner ramus half-length of peduncle, extending half-way to apex of telson.

13 × 6 mm. Slaty-grey, with pale dorso-lateral flecks, uropods pale.

Localities.—Cape Province: Port St. Johns (S.A. Mus.).

Transvaal: Barberton (S.A. Mus.); Komatipoort (R. W. E. T.); Kaapmuiden (R. W. E. T.); Sabie Game Reserve (E. L. G.).

Portuguese East Africa: Wanetsi River, tributary of Komati River (S.A. Mus.); Inhambane (K. H. B.); Maxixe (R. F. L.).

In the shapes of the internal teeth on segments 1 and 2, this species forms somewhat of a transition to *Dipleurochus*, but the mandible and pronotum show it to be better placed in *Bethalus*.

The Port St. Johns specimens have a slightly shorter telson.

Bethalus mucidus (B-L.).

(Fig. 46.)

1885. *Armadillo mucidus*. Budde-Lund, Crust. Isop. Terr., p. 32.

1904. „ „ *Id.*, Rev. Crust. Isop. Terr., p. 131.

1904. „ *latifrons*. *Id.*, *ibid.*, p. 132, pl. x, figs. 39–44.

Surface minutely granulate (appearance really caused by minute transverse impressions). Rugae distinct laterally but scarcely so medio-dorsally. Epistome considerably raised.

Peraeon segment 1 with postero-lateral corner subtruncate, emarginate; internal tooth prominent, obtuse, externally connected with the lateral margin by a slight thickening; internal tooth on segment 2 obtuse.

Epimera of segments 5 and 6 ventrally thickened. On epimera 2–7 there is a transverse or slightly oblique ridge on dorsal surface.

On epimera 2–7 there is also a faint submarginal ridge (*i.e.* parallel with body axis) on the lower surface.

Telson a little broader than long, apical margin almost straight, sides slightly incurved, dorsally somewhat convex basally, often with

an obscure median impression, followed by an obscure medio-longitudinal ridge; ventrally with median groove.

Antenna 2, 2nd joint of flagellum 2 to nearly 3 times 1st.

Uropod, peduncle narrowing distally, outer ramus reaching nearly to apex of peduncle, inner ramus extending $\frac{3}{4}$ distance to apex of telson.

Up to 20 × 9 mm. (♂♂ smaller than ♀♀). Slaty-grey or brownish, sometimes uniform with the lateral rugae pale, but usually more or less strongly mottled, antennae more or less suffused, eyes black.

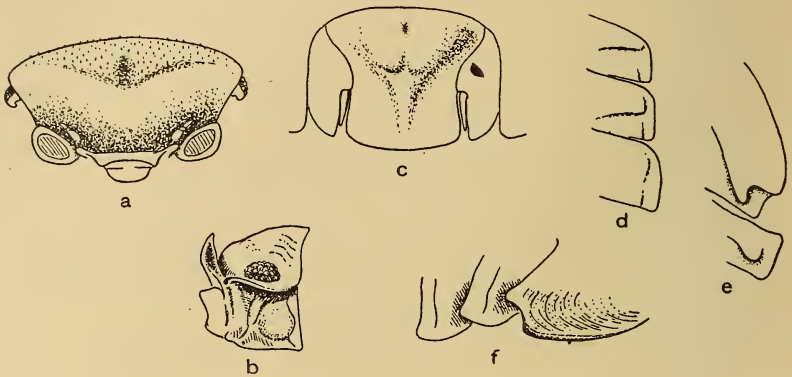


FIG. 46.—*Bethalus mucidus* (B.-L.). *a*, *b*, Frontal and lateral views of head; *c*, telson; *d*, ventral view of epimera 5-7; *e*, ventral view of epimera 1 and 2; *f*, external lateral view of epimera 1 and 2.

Localities.—Cape of Good Hope (Budde-Lund, coll. Drege, see p. 179).

Natal: Port Natal (= Durban) (Budde-Lund); Amanzimtoti (W. F. P.); Umgeni Valley (S.A. Mus.); Durban and Inchanga (K. H. B.).

Portuguese East Africa: Lorenzo Marques (K. H. B.).

As regards *mucidus* and *latifrons*, the former is not represented in the Budde-Lund collection in the British Museum, but the two descriptions are so extraordinarily alike that one cannot doubt the synonymy. Both *mucidus* and *latifrons* have the high raised epistome, and the "duplicatura" on the under surface of the 5th-7th epimera.

In some specimens from the Umgeni Valley the basal median impression on the telson is better marked than usual; consequently the raised portion on either side shows up better, and in some specimens the telson might almost be described as basally bituberculate, and bears a close resemblance to that of *warreni*.

Bethalus warreni (Cllege).

(Fig. 47.)

1917. *Cubaris warreni*. Collinge, Ann. Nat. Mus., iii, p. 569,
pl. xl, figs. 1-10.

1920. " " *Id., ibid.*, iv, pl. xxvii, fig. 1.

Surface minutely granulate. Rugae distinct. Epistome considerably raised.

Peraeon segment 1 with postero-lateral corner subtruncate, internal tooth acute; internal tooth on segment 2 subacute, extending to

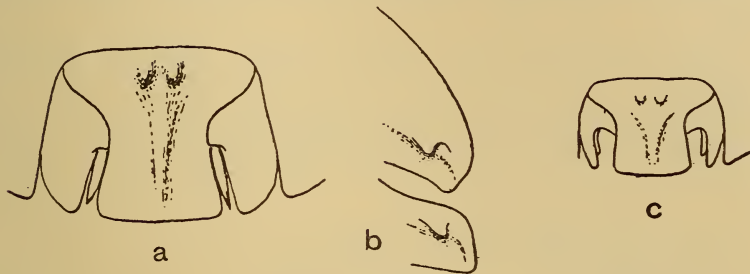


FIG. 47.—*Bethalus warreni* (Cllege). *a*, Telson and uropods of Howick specimen; *b*, ventral view of epimera 1 and 2 of same; *c*, telson and uropods after Collinge.

anterior margin. Epimera of segments 5-7 with transverse thickening below.

Telson broader than long, apical margin nearly straight, sides scarcely incurved, dorsally with 2 low tubercles basally, followed by a slight medio-longitudinal ridge; ventrally with median groove.

Antenna 2 very slender, especially the flagellum, 2nd joint $2\frac{1}{2}$ times 1st.

Uropod, peduncle subtriangular, narrowing (in the typical form) to a pointed apex, and leaving a marked gap between telson and 5th pleon segment, but sometimes subacute, outer ramus extending nearly to apex of peduncle, inner ramus long, extending nearly to apex of telson.

Up to 12×5.5 mm. In alcohol, greenish brown, with lighter mottling.

Localities.—Natal: Krantz kop (Collinge); Howick (W. F. P.).

Neither the mandibles nor the pronotum were mentioned in the original description. The species is assigned to *Bethalus* on account of the internal teeth on segments 1 and 2. The two specimens from

Howick confirm this. They can scarcely be regarded otherwise than as a variety of *warreni*. The only feature in which they do not agree with Collinge's description is the uropod; and it should be noted that the shape of the uropod in the whole figure of the animal on pl. xxvii (1920) is quite different from that in figs. 9 and 10 accompanying the original description.

Bethalus secutor (Jackson).

(Fig. 48.)

1924. *Cubaris secutor*. Jackson, J. Linn. Soc. Lond., xxxvi, p. 25, pls. i, ii.

Surface strongly setose. Rugae distinct. Epistome strongly raised.

Peraeon segments with the hind margin produced backwards in a median point, feeble on segment 1 but becoming progressively larger,



FIG. 48.—*Bethalus secutor* (Jackson). *a*, Lateral view of whole animal (epimeron of segment 3 defective) after Jackson, surface setae omitted; *b*, telson and uropods after Jackson.

that on segment 7 flanked on either side by a sharp tubercle. Internal teeth on segments 1 and 2 well marked.

Telson about as broad as long, apical margin nearly straight, sides incurved, dorsally bituberculate at base.

Uropod, peduncle narrowing to a narrowly rounded apex, but not leaving any gap between telson and 5th pleon segment, outer ramus moderately long, extending about to apex of peduncle, inner ramus moderately long.

8.5 × 5 mm. In alcohol, slaty-blue, flecked with grey.

Locality.—Zululand: Lower Umfolosi (Jackson).

This remarkable species should be included in the genus *Bethalus*. The pronotum is broad, and the mandible has a single free penicil. Moreover, it possesses the same features which distinguish *mucidus* and *warreni* from the other species, viz. the strongly raised epistome, the transverse ridge of 2nd-7th epimera, the subtruncate postero-lateral corner of peraeon segment 1, and also (apparently) the transverse ridge on underside of 5th and 6th (but not 7th) epimera.

Bethalus barnardi (Collge.).

1920. *Cubaris barnardi*. Collinge, Ann. Nat. Mus., iv, p. 482, pl. xxxi, figs. 67-76.

In general resembling *secutor*, but much less strongly sculptured. The median projection on the peraeon segments is not developed at all on segments 1-4, only very feebly on 5, and moderately on 6 and 7 (*cf.* Collinge's fig. 67). Internal tooth on segment 1 similar to that of *mucidus*.

Epimera of segments 5-7 with transverse ridge on lower surface, the anterior and inner portion of the epimera being thickened (*cf.* *mucidus*). There is a slight longitudinal (*i.e.* parallel with body axis) ridge across the pleurae of pleon segment 3, continuing the line of the submarginal edge of the thickenings on epimera 5-7, and sometimes a much fainter ridge on pleon segment 4 also.

Pronotum on segment 2 one-quarter, on posterior segments almost or quite one-third.

Antenna 2 slender, 2nd and 4th joints subequal, 2nd flagellar joint $2\frac{1}{2}$ -3 times 1st.

Uropod, outer ramus longer than in *secutor*, extending almost to apex of peduncle, and equal to $\frac{3}{4}$ length of inner ramus.

Up to 16×7.5 mm. (20.5 mm., Collinge). In alcohol, brownish or greyish, mottled, eyes black.

Localities.—Natal: Sarnia and Winkle Spruit (Collinge); M'fongosi, Zululand (Collinge; also S.A. Mus.); Pietermaritzburg and Krantz-kop (Natal Mus.).

I have examined a large number of specimens collected by Mr. W. E. Jones, in size from 4 mm. upwards. The sculpturing does not vary, so that this form and *secutor* may be considered separate species. The differences in sculpture and outer ramus of uropod are certainly great enough to justify specific rank. The difference in length of pronotum is perhaps not really so great. Jackson's fig. 1, on pl. i,

has the visible portion of the pronotum on segment 7 slightly greater than $\frac{1}{4}$, *i.e.* not including the median projection. But whether *barnardi* should be separated from *mucidus* is very doubtful; the question can only be cleared up by detailed collecting and observation, whether forms with a short process on hind margin of 7th segment occur in the same locality together with forms without any trace of a process.

Gen. AKERMANIA Collge.

1919. *Akermania*. Collinge, Ann. Nat. Mus., iv, p. 230.

Head concrete, antennary tubercles not distinct, epistome adnate to head dorsally, lateral marginal line of head continuous with margin of epistome.

Epimera, especially 1 and 2, spread out more or less horizontally, margin of 1st thin, internal teeth on 1st and 2nd well developed.

Pronotum very broad, $\frac{1}{3}$ – $\frac{2}{5}$ length of segment.

Antenna 2 with 2-jointed flagellum. Mandible with a single free penicil. Inner lobe of maxilla 1 with 2 slender, subequal plumose setae, outer apex quadrate.

Peraeopod 1 with feeble groove on anterior surface of 5th joint.

Uropod, peduncle oblong, outer ramus minute, cylindrical.

Genotype: *spinosa* Collge.

But for the broad pronotum, this form could be included in *Polyacanthus*; in fact it bears a very close external resemblance to *P. aculeatus*. The broad pronotum, however, points to *Bethalus*, and in spite of Collinge's opinion that *Akermania* is widely separated from *Cubaris* or any of the allied genera, it seems to me to be essentially related to *Bethalus*, though the lateral marginal line of head is continued on to the epistome as in *Cubaris*.

The 1st antennae are present.

Nicholls and Barnes (1926, J. Roy. Soc. West Austr., xii, pp. 149, 153, 154) draw attention to the strong likeness between their *Cubaris wilsmorei* and *Akermania spinosa*. In my opinion *wilsmorei* should be transferred to *Akermania*, provided it has a broad pronotum, which feature is not mentioned by the authors.

Akermania spinosa Collge.

(Fig. 49.)

1919. *Akermania spinosa* Collinge, *loc. cit.*, p. 230, pl. xiv, figs. 1–12 (fig. 1 shows 8 peraeon segments and 4 expanded pleon segments).

Surface minutely setulose, with numerous short spinous processes, whose bases are connected by low ridges.

Head with 3 transverse rows of spines, the anterior row with 4, the middle one with 6, the posterior one with 3 spines. Epistome distinctly, though not strongly, raised above dorsal surface of head; dorso-lateral angles rounded and partly covering eyes in frontal view (contrast Collinge's fig. 2), in front convex above, concave below,

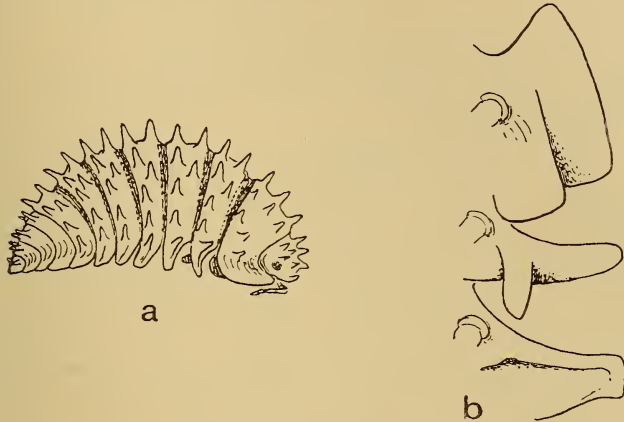


FIG. 49.—*Akermania spinosa* Clge. *a*, Lateral view of whole animal; *b*, ventral view of epimera 1-3.

the dorsal margin medianly slightly recurved, and in some positions appearing slightly emarginate.

Peraeon segment 1 with 3 transverse rows of spines, respectively with 4, 4, 10 spines. The two outside ones of the posterior row should perhaps be reckoned to the middle row, when the formula would read 4, 8, 6. Epimera nearly horizontal, internal tooth or lamina strong, subquadrate.

Peraeon segments 2-6 each with 2 transverse rows of spines, respectively with 4 and 10 spines. Epimera becoming less horizontal posteriorly, 2 and 3 narrowed, 4-6 less so, internal tooth on 2 prominent, acute in ventral view, but rounded in lateral view (visible externally), 3-6 each with a transverse ridge below, well marked on 3, but fainter on the other epimera.

Peraeon segment 7 with 2 transverse rows of spines, respectively with 8 and 4 spines.

Pleon segments 3-5 with the pleurae slightly spread, but not quite horizontal, each with 2 submedian spines.

Telson much broader than long, apical margin straight, shorter than length, dorsally with 2 spines.

Antenna 2, 2nd and 4th joints subequal, 2nd joint of flagellum 3 times 1st.

Uropod, peduncle broad proportionately to length, apex subquadrate, completely filling space between telson and 5th pleon segment, outer ramus minute, inner ramus extending half-way to apex of telson.

4 × 2 mm. Pale straw-colour, segments 1 and 7 rather irregularly suffused with brown, chiefly laterally, eyes black.

Localities.—Natal: Umhlali and Winkle Spruit (Collinge); Stella Bush, Durban (K. H. B.).

There may be some variation in the number and arrangement of the spines. The above description is taken from my Durban ♀. Collinge's fig. 2 shows 3 series on the head, with respectively 3, 6, 3 spines; his fig. 1 shows 2 rows with 4 and 5 spines respectively. He states that there are 2 rows on the segments of the mesosome (peraeon); his fig. 1 shows only 1 row of 6 spines on segment 1, and 2 rows of 6 each (usually) on segments 2-7; fig. 7, a transverse view of segment 1, shows 2 rows of 4 and 10 spines. These differences are probably due to the draughtsman, who also seems at least partly responsible for the manifest inaccuracies of fig. 1.

The 1st antennae are quite distinct in my specimen. The uropods fill the space between telson and 5th pleon segment. Nevertheless there cannot be the slightest doubt that the Durban specimen, from a locality roughly midway between the two original localities, is conspecific.

Gen. POLYACANTHUS B-L.

1904. *Armadillo* (part). Budde-Lund, Rev. Crust. Isop. Terr., pp. 97, 116 (Section iv).

1909. *Polyacanthus*. *Id.*, in Schultze, Reise, ii, p. 54 (subgen. of *Armadillo*).

Head concrete, antennary tubercles not distinct, epistome without median raised shield, lateral marginal line of head continuous with epistome.

Hind margin of peraeon segment 1 sinuate. Epimeron of segment 1 large, thin; internal teeth on segments 1 and 2 small.

Pronotum narrow.

Antenna 2, 2nd and 4th joints subequal, flagellum 2-jointed. Mandible with a single free penicil. Maxilla 1 with 2 unequal rather

short plumose setae on inner lobe, the outer apex of which is rounded.

Uropod, peduncle oblong, outer ramus cylindrical, minute.

Genotype: *aculeatus* (B-L.).

Key to the species.

1. Head and peraeon spinose *aculeatus*.
2. Head and peraeon rugulose and tuberculate *transvaalensis*.

Polyacanthus aculeatus (B-L.).

1885. *Armadillo aculeatus*. Budde-Lund, Crust. Isop. Terr., p. 289.

1904. *Polyacanthus* ,, *Id.*, Rev. Crust. Isop. Terr., p. 117,
pl. x, figs. 10-13.

Head with 4 spines in a transverse row. Peraeon segments each with 6 spines in a transverse row, the 2 median ones smaller than the others. Pleon segments 3-5 each with 2 small spines. Telson as long as broad, subquadrangular, sides incurved.

7 × 4 mm.

Locality.—Chinchoxo, Portuguese Congo (Budde-Lund).

This is not a South African species, but is included for the sake of completeness and comparison with the following species.

Polyacanthus transvaalensis n. sp.

(Fig. 50.)

Strongly convex, 1st epimeron and the pleurae spread out more or less horizontally, the other epimera less so. Surface strongly squamulose with smaller squamulae interspersed among the larger ones, especially on hind margins of segments.

Head rugulose. Eyes well developed. Epistome strongly raised above dorsal surface of head, in front flat, dorsal margin gently convex, dorso-lateral angles quadrate.

Peraeon segment 1 with a V-shaped median boss anteriorly, flanked by 2 smaller rounded bosses on either side, about 12 elongate rugae in a transverse series, and a series of small rounded tubercles on the hind margin alternating with the rugae.

Peraeon segments 2-7 distinctly divided into a smooth anterior portion and a raised posterior portion, the latter bearing on each segment a transverse series of about 14 rugae, followed by smaller tubercles alternating with them.

Pronotum of segment 2 one-twelfth, of posterior segments about one-tenth dorsal length of segment.

Epimeron of segment 1 large, thin, splayed outwards but not reflexed; internal tooth on both segments 1 and 2 small, rounded.

Segments 5-7 with faint longitudinal (*i.e.* parallel to body axis) ridge about midway between insertion of peraeopods and lateral margins of epimera.

Pleon segments 3-5 each with 4 rounded bosses, the 2 inner ones larger than the outer ones, especially on segment 5.

Telson longer than broad, anterior and posterior widths subequal,

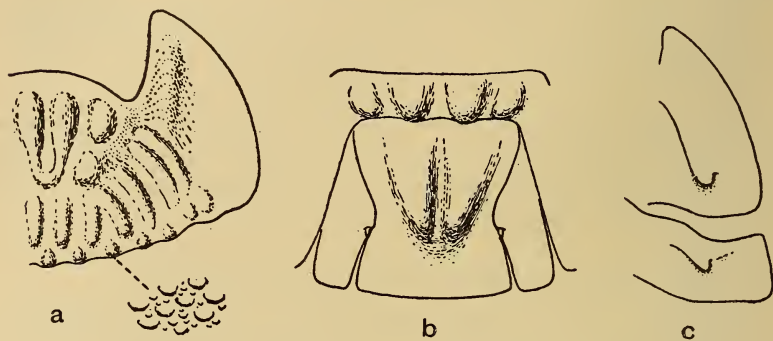


FIG. 50.—*Polyacanthus transvaalensis* n. sp. a, Dorsal view of peraeon segment 1; b, 5th pleon segment, telson, and uropods; c, ventral view of epimera 1 and 2.

sides incurved, apical margin nearly straight, dorsally with a prominent rounded boss proximally, divided by a medio-longitudinal groove.

Antenna 2 short and stout, 2nd joint slightly longer than 4th, flagellum scarcely as long as 4th joint, much narrower than 5th, its 2nd joint 3 times 1st.

Peraeopod 1 with very feeble groove on anterior surface of 5th joint.

Uropod, peduncle considerably longer than wide, distally narrowed to a subquadrate apex, which extends slightly beyond margin of telson and pleurae of 5th pleon segment, outer ramus minute, inner ramus short, twice as long as broad.

9 × 4 mm. Slaty-grey, eyes black, antennae and legs pale.

Locality.—Transvaal: Zoutlansberg (R. F. L.).

This species is referable to Budde-Lund's Section iv = *Polyacanthus*. The name proves to have been unfortunately chosen, as this species is not spinose like *aculeatus*. It forms an interesting extension of the genus.

Gen. DIPLOEXOCHUS Brdt.

1833. *Diploexochus*. Brandt, Conspect. Onisc.
1904. *Armadillo* (part). Budde-Lund, Rev. Crust. Isop. Terr.,
pp. 97, 100 (Section ii).
1909. *Diploexochus*. *Id.*, in Schultze, Reise, ii, p. 54 (subgen. of
Armadillo).
1910. „ *Id.*, Voeltzkow, Sjöstedts Kilimandjaro-
Meru Exp., iii, p. 11.

Head concrete, antennary tubercles not distinct, epistome without median raised shield, adnate to dorsal surface of head, lateral marginal line of head continued on to epistome.

Hind margin of peraeon segment 1 more or less sinuate. Epimeron of segment 1 with margin thin or costate, more or less completely grooved, at least near hind corner, internal fold and tooth well developed; internal fold or tooth on segment 2 usually well developed.

Pronotum narrow or very narrow, seldom exceeding one-seventh of length of segment, usually much less.

Antenna 2 with 2-jointed flagellum. Mandible with a single free penicil. Maxilla 1 with 2 subequal slender plumose setae on inner lobe, the outer apex of which is rounded.

Peraeopod 1 with groove on anterior surface of 5th joint.

Uropod, peduncle oblong or subquadrangular, outer and inner rami moderate or more usually short, often very short, the outer ramus being minute or obsolescent, when present cylindrical.

Genotype: in 1904 Budde-Lund gave *clausus* B-L. (S. America) as genotype of his Section ii, but in 1909 substituted *echinatus* Brdt. (S. America).

According to Budde-Lund (1904) the genus extends over the north-eastern and north parts of South America (one species in Chile), central and southern parts of North America, West Indies, Canary Islands, Cape Verde Islands, and Africa (one species in South Spain). Some of the species, however, may perhaps have been wrongly assigned.

This is the most numerous, and the most difficult genus of the Cubarids. As will be seen from the following pages, a moderate amount of collecting has produced a large increase in the number of known species; and obviously many more still await discovery.

As a generic character the width of the pronotum, especially if taken in conjunction with other characters, appears to be sound, though subject to considerable range. At one end of the scale it is very narrow, as in Budde-Lund's Section i (*Pentheus officinalis*); at

the other end it is very broad as in *Bethalus*. As a specific character there need be no hesitation in using it, in spite of the gradation. But I express no opinion as to whether it can be regarded as an indication of affinity. The species are here arranged according to the width of the pronotum solely for the sake of convenience.

Neither the distribution nor the habitats of the species disclose any correlation between the width of the pronotum and the environment. All the species with very narrow pronotum are subtropical (synopsis 1a), but there are also subtropical species with only a moderately narrow pronotum (*rhodesiensis*, *makuae*, *tugelae*; excluding *aenigma* and *cingulatus* as outstanding exceptions in the whole genus). Most of the species have a pronotal width of $\frac{1}{12}$ – $\frac{1}{10}$ (synopsis 1c) and they are mostly congregated in the southerly and south-westerly areas of South Africa, the explanation being merely that more collecting has been done in these areas. There are species living in the plains, as well as species living on the mountain-tops. Myrmecophily does not afford an explanation. The faculty of "congloitation" seems to be no better developed in those species with a narrow pronotum than in those with a wide pronotum; though one would like to think that some correlation might be demonstrable by a close study of the habits and habitats of the animals.

The *tabularis* group, comprising *tabularis*, *ecaudatus*, *albanyensis*, and *hypselos*, is interesting as showing the same method of interlocking of peraeon segments 1 and 2 as is found in *Microcercus*. *D. tuberosus* (Budde-Lund, 1904, pl. x, fig. 1) from the West Indies also exhibits the same feature.

Instead of a dichotomous key, I have followed Budde-Lund in giving a synopsis of the South African species. By elimination a specimen can be run down to a group of species, and can then be identified by reference to the descriptions and figures.

- | | | |
|--|---|---|
| 1a. Pronotum very narrow, linear, $\frac{1}{20}$ – $\frac{1}{15}$ of dorsal length of segment (segment 2 measured) | { | <i>formicarum</i> , <i>ovampoensis</i> , <i>kaokoensis</i> , <i>nanus</i> , <i>obliquidens</i> , <i>thomsoni</i> , <i>damarensis</i> , <i>salisburyensis</i> . |
| 1b. Pronotum narrow, $\frac{1}{15}$ – $\frac{1}{12}$ | { | <i>saldanhae</i> , <i>steenbrasi</i> . |
| 1c. Pronotum moderately narrow, $\frac{1}{12}$ – $\frac{1}{10}$ | { | <i>nigricans</i> , <i>pachyotos</i> , <i>dollfusi</i> , <i>mixtus</i> , <i>kogmani</i> , <i>albescens</i> , <i>rufescens</i> , <i>coloratus</i> , <i>flavescens</i> , <i>festivus</i> , <i>montagui</i> , <i>oraniensis</i> , <i>herscheli</i> , <i>orphanus</i> , <i>alticola</i> , <i>rhodesiensis</i> , <i>pauperculus</i> , <i>polythete</i> , <i>meiringi</i> , <i>alberti</i> , <i>tugelae</i> , <i>pusillus</i> , <i>tabularis</i> , <i>ecaudatus</i> , <i>albanyensis</i> , <i>hypselos</i> . |

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| 1d. Pronotum moderate, $\frac{1}{8}$ - $\frac{1}{7}$ | { | <i>pubescens, conisaleus, makuae, limenites, hypsinephes, zwartbergensis, nebulosus, furcatus, castor, celsicauda.</i> |
| 1e. Pronotum rather broad, $\frac{1}{6}$ - $\frac{1}{5}$ | { | <i>disjunctus, longipes, quadrimaculatus, gordoniensis, pilula.</i> |
| 1f. Pronotum broad, $\frac{1}{4}$ - $\frac{1}{3}$ | { | <i>aenigma, cingulatus.</i> |
| Unknown: <i>orbicularis, liliputanus, natalensis, truncatus.</i> | | |
| 2a. Epistome rising considerably above dorsal surface of head | { | <i>formicarum, makuae, orbicularis.</i> |
| 2b. Epistome not strongly raised | { | all other species. |
| 2c. Epistome feebly demarcated from head dorsally | { | <i>kaokoensis, thomsoni, damarensis, saldanhae, steenbrasi, pilula.</i> |
| 3a. Peraeon segment 1 grooved along whole length of epimeral margin | { | <i>ovampoensis, kaokoensis, nanus, salisburyensis, saldanhae, steenbrasi, mixtus, kogmani, meiringi, alberti, tugelae, pusillus, tabularis, makuae, aenigma, liliputanus, natalensis.</i> |
| 3b. Peraeon segment 1 partially grooved | { | all other species. |
| 3c. Peraeon segment 1 without marginal groove | { | <i>formicarum, oraniensis, herscheli, albanyensis, hypselos, pubescens, conisaleus, longipes, quadrimaculatus, cingulatus.</i> |
| 4a. Peraeon segment 1 with hind corner equally or subequally cleft (i.e. the inner lamina or tooth extends backwards to, or almost to, the level of hind margin of segment) | { | <i>ovampoensis, nanus, obliquidens, thomsoni, salisburyensis, saldanhae, steenbrasi, nigricans, kogmani, herscheli, alberti, tugelae, pusillus, pubescens, conisaleus, zwartbergensis, nebulosus, gordoniensis, pilula, orbicularis, liliputanus.</i> |
| 4b. Peraeon segment 1 distinctly unequally cleft | { | all other species. |
| 5a. Outer ramus of uropod minute or obsolescent | { | all of 1a except <i>thomsoni</i> ; 1b; <i>dollfusi, albescens, alticola, rhodesiensis, pauperculus, polythele, meiringi, alberti, tugelae, pusillus, tabularis, ecaudatus, albanyensis, hypselos, pubescens, conisaleus, makuae, longipes, quadrimaculatus, gordoniensis, pilula, cingulatus, orbicularis.</i> |
| 5b. Outer ramus of uropod distinct | { | all other species. |
| 6a. Inner ramus of uropod long, extending beyond half-way to apex of telson (as visible from below) | { | <i>kaokoensis, thomsoni, steenbrasi, herscheli, tugelae, tabularis, ecaudatus, albanyensis, makuae, furcatus, aenigma, cingulatus, liliputanus, natalensis.</i> |

- | | |
|---|--|
| 6b. Inner ramus of uropod not exceeding half length of telson, mostly much shorter | } all other species. |
| 7a. A ridge or thickening on lower surface of epimera of segments 5-7 | |
| 7b. A similar ridge on pleurae of pleon segments 3-5 in addition to the above ridge on segments 5-7 | } <i>ovampoensis</i> , <i>kaokoensis</i> , <i>nanus</i> ,
<i>obliquidens</i> , <i>thomsoni</i> , <i>salisburyensis</i> , <i>saldanhae</i> , <i>mixtus</i> , <i>kogmani</i> ,
<i>albescens</i> , <i>coloratus</i> , <i>flavescens</i> ,
<i>festivus</i> , <i>montagui</i> , <i>pubescens</i> ,
<i>conisaleus</i> , <i>makuuae</i> . |
| 7c. A ridge across peduncle (ventral surface) of uropod | |
| | } <i>kaokoensis</i> , <i>thomsoni</i> , <i>salisburyensis</i> , <i>pubescens</i> , <i>conisaleus</i> . |
| | } <i>limenites</i> , <i>hypsinephes</i> . |

Diploexochus formicarum B-L.

(Fig. 51.)

- ? 1895. *Armadillo orbicularis*. Dollfus, Mem. Soc. Zool. Fr., viii, p. 345, fig. 2 (*non* B-L.).
1909. *Diploexochus formicarum*. Budde-Lund in Schultze, Reise, ii, p. 57, pl. v, figs. 44-56.
1910. ,, ,, Stebbing, Gen. Cat. S. Afr. Crust., p. 447.

Rugae distinct, segment 1 with 7 granules on anterior margin, the 2 median ones largest, followed by 2 transverse rows of granules, the posterior ones smaller, segments 2-7 distinctly divided into a smooth anterior portion and a raised posterior portion bearing 2 transverse rows of granules on each segment, the granules of the posterior row smaller than the anterior ones; pleon segments 3-5 each with a transverse row of granules.

Eyes moderate. Epistome considerably raised above surface of head.

Peraeon segment 1, margin thin, slightly reflexed, not grooved, hind corner unequally cleft, internal tooth small; internal tooth on segment 2 small.

Pronotum very narrow, linear.

Telson slightly broader than long, sides slightly incurved, apical margin almost straight, dorsally with 2 submedian rounded ridges or elongate tubercles proximally.

Antenna 2 short and stout, 2nd joint longer than 4th, flagellum equal to 4th joint, its 2nd joint not quite 3 times 1st.

Uropod, peduncle considerably longer than wide, narrowing to the

subquadrate apex, outer ramus minute, inner ramus short, twice as long as broad.

3.5 × 1.6 mm. In alcohol, greyish-white, unicolorous.

Localities.—Bechuanaland: Vryburg (Dollfus); Kooa, Kalahari (Budde-Lund).

Although it is clear that the *orbicularis* of Dollfus is not the true *orbicularis* of B-L., I am not quite sure that it is the same as *formicarum*. Dollfus says the 1st peraeon segment is grooved throughout its length, and that the epistome is not raised above the level of the head.

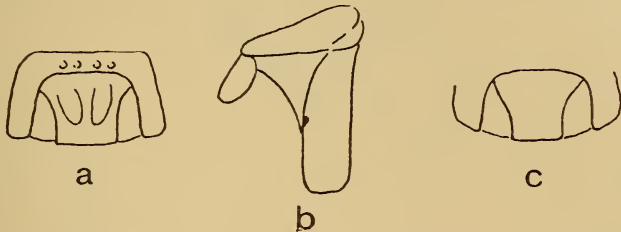


FIG. 51.—*Diploexochus formicarum* B-L. a, 5th pleon segment, telson and uropods after Budde-Lund; b, dorsal view of uropod after Budde-Lund; c, telson of *orbicularis* Dollf. non B-L., after Dollfus.

But his figure of the telson and uropods resembles Budde-Lund's figures of these parts, except for the absence of the two ridges on the telson.

The (comparative) nearness of the two localities is in favour of specific identity.

Diploexochus salisburyensis n. sp.

(Fig. 52.)

Surface minutely granulate (shagreened). Rugae obsolete or very faintly indicated. Epistome not strongly raised.

Peraeon segment 1, epimeral margin thick, reflexed, grooved throughout its length, hind corner equally cleft, internal tooth rounded; internal tooth on segment 2 well developed.

Pronotum very narrow, almost linear, $\frac{1}{20}$ of dorsal length of segment.

Epimera of segments 5-7 with a transverse (*i.e.* to body axis) ridge on lower surface, petering out slightly before reaching margin.

Pleurae of pleon segments 3-5 with a low ridge or thickening on lower surface near hind margin.

Telson a little broader than long, sides incurved, apical margin nearly straight, dorsally raised with a shallow more or less conspicuous oval or lozenge-shaped impression.

Antenna 2, 2nd and 4th joints subequal, 2nd flagellar joint 4 times the 1st.

Uropod, peduncle longer than broad, apex subquadrate, outer ramus very small but distinct, inner ramus short, twice as long as broad, extending scarcely half-way to apex of telson.

Up to 9×3.5 mm. In alcohol, greyish, eyes darker.

Locality.—Rhodesia : Salisbury (R. W. E. T.).

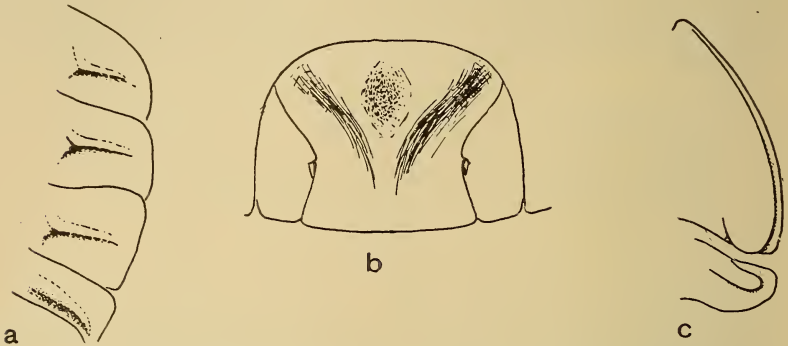


FIG. 52.—*Diploexochus salisburyensis* n. sp. *a*, Ventral view of epimera 5-7 and pleura of pleon segment 3; *b*, telson and uropods; *c*, ventral view of epimera 1 and 2.

Compared with *obliquidens* this species has a narrower epimeron on peraeon segment 2, with a less oblique tooth, a slightly more convex telson with a slightly stronger impression. The margin of peraeon segment 1, moreover, is grooved throughout.

Diploexochus ovampoensis (Brnr.).

(Fig. 53, *d*.)

1924. *Cubaris ovampoensis* (part). Barnard, Ann. S. Afr. Mus., xx, p. 232, fig. 1.

Surface minutely squamulose-granulose. Rugae feebly developed. Epistome not strongly raised.

Peraeon segment 1 with a low rounded median boss anteriorly, obscurely divided by a medio-longitudinal faintly impressed line; epimeral margin reflexed, grooved throughout its length, hind corner equally cleft, internal tooth rounded; internal tooth on segment 2 strong, narrow, curving obliquely posteriorly.

Pronotum very narrow.

Epimera of segments 5-7 with transverse ridge on lower surface.

Telson broader than long, sides slightly incurved, apical margin nearly straight, dorsally convex and tumid proximally, with a faint medio-longitudinal impressed line.

Antenna 2, 2nd joint a trifle longer than 4th, 2nd flagellar joint $2\frac{1}{2}$ to nearly 3 times 1st.

Uropod, peduncle about as broad as long, or very slightly longer than broad, apex subquadrate, outer ramus minute, inner ramus short, twice as long as broad.

Up to 6×2.5 mm. Slaty-grey, with lighter reticulation on head and peraeon, lateral margins usually paler, eyes black.

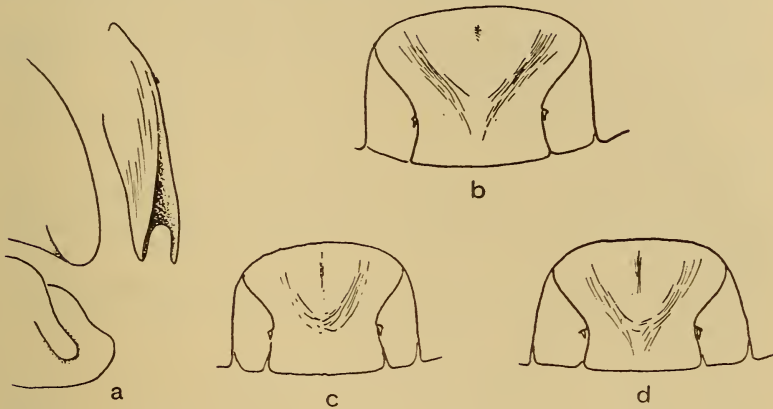


FIG. 53.—*Diploexochus obliquidens* n. sp. a, Ventral view of epimera 1 and 2, with marginal view of epimeron 1; b, telson and uropods. *D. nanus* B-L.: c, telson and uropods, after MSS. drawing by Budde-Lund in British Museum. *D. ovampoensis* (Brnd.): d, telson and uropods.

Localities.—Ovamboland: Namakunde and Ongandjera (Barnard).

This species has a slightly stouter internal tooth on segment 2, and a more tumid telson than *obliquidens*, in both of which characters it is very close to *nanus*; it differs, however, from both these species in having the whole margin of segment 1 grooved. I am unable to determine whether this species is the same as *bituberculatus* B-L., 1910, from Kilimanjaro, which has the whole margin of segment 1 grooved, and the MSS. figure of which shows a telson similar to that of *ovampoensis*. Only a comparison of actual specimens can decide.

Re-examination of the original specimens shows that the specimens from Erikson's Drift, formerly included under this species, are really referable to the form here identified as *nanus*.

Diploexochus obliquidens n. sp.

(Fig. 53, a, b.)

Surface minutely granulate. Rugae obsolete. Epistome not strongly raised.

Peraeon segment 1 with margin thick, reflexed, grooved in posterior half, but the groove faintly traceable for about $\frac{2}{3}$ length, hind corner equally cleft, internal tooth rounded. Internal tooth on segment 2 strong, but narrow, curving obliquely posteriorly.

Pronotum very narrow, linear, $\frac{1}{10}$ of dorsal length of segment.

Epimera of segments 5-7 with transverse ridge on lower surface.

Telson a little broader than long, sides gently incurved, apical margin nearly straight, dorsal surface slightly raised with a small very faint median impression.

Antenna 2, 2nd joint a trifle longer than 4th, 2nd flagellar joint 2-2 $\frac{1}{2}$ times 1st.

Uropod, peduncle a little longer than broad, apex subquadrate, outer ramus very small but distinct, inner ramus short, twice as long as broad.

Up to 11 × 5 mm. Slaty-grey, lateral margins pale, eyes black.

Localities.—Transvaal: Messina (R. W. E. T.); Sabie Game Reserve (E. L. G.); Zoutpansberg (R. F. L.).

This species is very close to *nanus* B-L. from the Mt. Meru district in Tanganyika; it is distinguished by the obsolete rugae, the slightly broader 2nd segment, the narrower internal tooth on segment 2, and the less convex telson; the latter difference is deduced from Budde-Lund's description "valde tumido" and his MSS. figure of the telson.

Diploexochus nanus B-L.

(Fig. 53, c.)

1910. *Diploexochus nanus*. Budde-Lund, Sjöstedt, Kilimandjaro-Meru Exp., iii, p. 12, pl. ii, figs. 9-15.
 1924. ,, ,, Panning, Beitr. Kennt. Land. Süßwasserf. S.W. Afr., ii, p. 178.
 1924. *Cubaris ovampoensis* (part). Barnard, Ann. S. Afr. Mus., xx, p. 232.

This form agrees with *ovampoensis* except that the groove on segment 1 extends only half-way or at most two-thirds along the margin, and the peduncle of uropod is apically narrower.

Up to 7 × 3 mm. Colour like that of *ovampoensis*.

Localities.—Ovamboland : Kunene River, near Erikson's Drift (Barnard).

Kaokoveld : Kaoko Otavi, Otjitundua, and Okorosave (K. H. B.) ; Warmbad (R. F. L. and A. J. H.).

Damaraland : Karibib (Panning).

Great Namaqualand : Seeheim (Panning).

These specimens are evidently the same as those which Panning, with some hesitation, referred to *nanus*. Without comparison of actual specimens, there seems to be considerable justification for Panning's decision, and I follow him here. The main difference which Panning found was caused by a misconception. In measuring the length of the pronotum, Panning included the smooth anterior half of the segment as well as the true articular surface. All the specimens I have seen conform to Budde-Lund's description of the pronotum as very narrow ($\frac{1}{20} - \frac{1}{15}$).

It is curious that Budde-Lund's *bituberculatus* and *nanus* differ from one another in the extent of the groove on segment 1, and the apical width of the peduncle of uropod, exactly as do *ovampoensis* and the South West Africa form assigned to *nanus*. Budde-Lund's MSS. in the British Museum contains unpublished figures of the telson of both species.

Diploexochus thomsoni Pann.

(Fig. 54.)

1924. *Diploexochus thomsoni*. Panning, Beitr. Kennt. Land. Süßwasserf. S.W. Afr., ii, p. 177, fig. 2.

Surface minutely squamulose-granulose. Rugae obsolete. Epistome feebly demarcated from dorsal surface of head, with a small V-shaped median impression dorsally.

Peraeon segment 1 smooth on anterior margin. Epimeral margin thick, reflexed, grooved in posterior third, hind corner subequally cleft, internal tooth rounded, visible externally in lateral view. Internal tooth on segment 2 small, oblique.

Pronotum very narrow, about $\frac{1}{15}$ of dorsal length of segment.

Epimera of segments 5-7 thickened below, forming transverse, or on segment 7 angularly oblique, ridges. Similar oblique ridges on pleurae of pleon segments 3-5.

Telson broader than long, distal portion slightly broader than long, sides gently incurved, distal margin slightly convex, dorsally evenly convex ; ventrally with median groove at base.

Antenna 2, 2nd joints and 4th subequal, 2nd flagellar joint 3-4 times 1st.

Uropod, peduncle slightly longer than broad, apex subquadrate, apical margin $\frac{1}{3}$ length of apical margin of telson, outer ramus small, extending $\frac{1}{4}$ to apex of peduncle, inner ramus rather long, extending $\frac{2}{3}$ - $\frac{3}{4}$ to apex of telson, 3-4 times as long as broad.

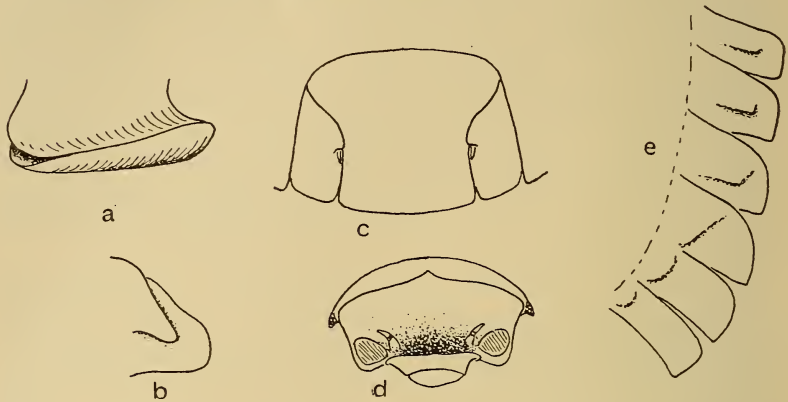


FIG. 54.—*Diploexochus thomseni* Pann. *a*, External lateral view of epimeron 1; *b*, ventral view of epimeron 2; *c*, telson and uropods; *d*, front view of head; *e*, ventral view of epimera 5-7 and pleurae of pleon segments 3-5.

Up to 7×3 mm. Slaty-grey, with paler dorso-lateral flecks, lateral margins often pale, eyes black.

Localities.—Damaraland: Waterberg and Okahandja (Panning); Waterberg (R. W. E. T.).

Local variety of *thomseni*.

Distinguished from the typical form by the telson and uropod. The telson is at least as long as broad, or even a little longer than broad, the distal portion also slightly longer than broad. The peduncle of the uropod is narrower, the apical margin being only one-quarter the length of the apical margin of telson.

5×2 mm. Slaty-grey.

Localities.—Damaraland: Narebis and Outjo (K. H. B.).

Kaokoveld: Kamanyab (R. F. L. and A. J. H.); Kaoko Otavi (K. H. B.).

When typical Waterberg specimens are placed side by side with specimens from the Kaokoveld the differences are obvious. Nevertheless the latter can be regarded only as a local variety. Among

several specimens from Narebis (a locality intermediate between Waterberg and the Kaokoveld) some are intermediate as regards the length of telson and width of uropods, while a few are definitely of the Kaokoveld form.

Diploexochus damarensis Pann.

1924. *Diploexochus damarensis*. Panning, Beitr. Kennt. Land. Süßwasserf. S. W. Afr., ii, p. 181.

In many respects agrees with *thomsoni*, but the groove on 1st segment slightly longer, extending almost half-way along the thickened margin, which is more strongly reflexed. A slight ridge on under side of epimeron 3 and a slight thickening on 4; the following segments show "nothing remarkable," from which it may be assumed that the transverse ridges, so clearly defined in *thomsoni*, are here absent. The same may be said of the pleurae of segments 3-5.

Pronotum narrow.

Telson half as long again as broad, the distal portion also half as long again as broad, sides incurved, dorsally with medio-longitudinal keel.

Antenna 2, 2nd flagellar joint 4 times 1st.

Uropod, outer and inner rami both very small, twice as long as wide.

Locality.—Damaraland: Neudamm, near Windhoek (Panning).

I have seen no examples referable to this species. The type material should be compared with that of *longipes* and *quadrimaculatus*.

Diploexochus kaokoensis n. sp.

(Fig. 55.)

Surface minutely squamulose-granulose. Rugae obsolete. Epistome not demarcated from dorsal surface of head except at the sides, convex above, biconcave below for the reception of the 2nd antennae.

Peraeon segment 1 quite smooth on anterior margin. Epimeral margin thick, reflexed, grooved for nearly its whole length, the whole groove visible externally in side view, hind corner unequally cleft, internal tooth rounded. Internal tooth on segment 2 small, oblique.

Pronotum very narrow, $\frac{1}{3}$ of dorsal length of segment.

Epimera of segments 5-7 with faint oblique or transverse ridge on lower surface.

Pleurae of pleon segments 3-5 with a similar ridge.

Telson broader than long, distal portion short, rectangular, sides and apical margin straight, dorsal surface evenly convex.

Antenna 2, 2nd and 4th joints subequal, 2nd flagellar joint 3 times 1st.

Uropod, peduncle as broad as long, apically broadly subquadrate, outer ramus very small, inner ramus extending almost to apex of telson, about 4 times as long as broad.

Up to 5×1.75 mm. Slaty-grey, eyes black.

Locality.—Kaokoveld: Kaoko Otavi (K. H. B.).

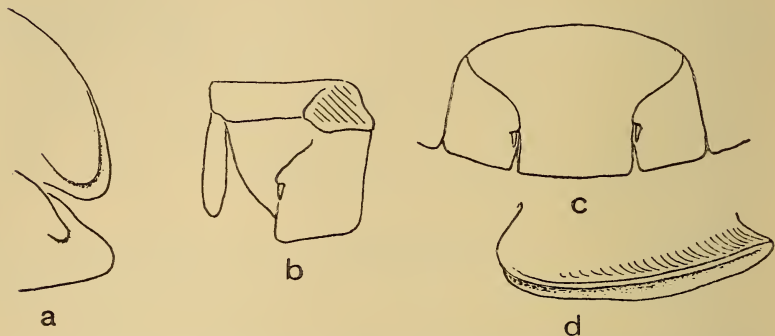


FIG. 55.—*Diploexochus kaokoensis* n. sp. a, Ventral view of epimera 1 and 2; b, dorsal view of uropod; c, telson and uropods; d, external lateral view of epimeron 1.

The complete obliteration of the dorsal margin of the epistome, except for a short distance at the sides, is distinctive. This feature, the completely grooved margin of 1st segment, broad uropod, and short rectangular distal portion of the telson easily distinguish this species from *thomsoni*.

Diploexochus saldanhae n. sp.

(Fig. 56, c-e.)

Strongly convex. Rugae distinct, tubercular, on the peraeon segments arranged in 2 transverse rows, the anterior row on segment 1 with 4 rounded tubercles rather larger than the others, the tubercles on the other segments subequal in size, more elongate; segments 2-7 with the smooth anterior portion sharply divided from the raised, tuberculate, posterior portion. Pleon segments 3-5 with a series of rounded granules distally.

Epistome scarcely raised above level of head, convex above, deeply biconcave below. Eyes well developed, marginal.

Peraeon segment 1 with margin thick, grooved throughout its length, hind corner equally cleft, internal tooth rounded. Internal tooth on segment 2 well developed. Epimeron of segment 2 narrowed distally.

Pronotum about $\frac{1}{1.5} - \frac{1}{1.2}$.

Segments 5-7 with transverse ridge on lower surface.

Telson half as wide again as long, distal portion short, sides slightly incurved, apical margin straight, slightly reflexed, dorsally with 2 submedian rounded ridges or elongate tubercles.

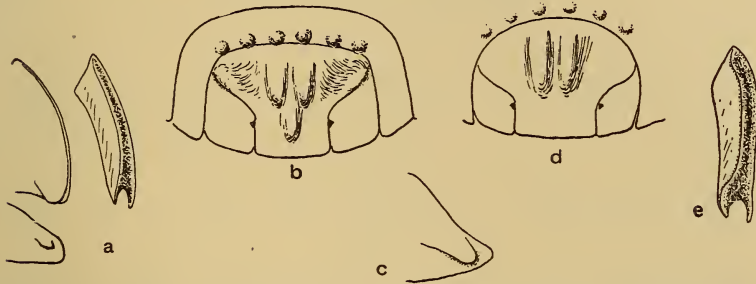


FIG. 56.—*Diploexochus steenbrasi* n. sp. *a*, Ventral view of epimera 1 and 2, with marginal view of epimeron 1; *b*, 5th pleon segment, telson, and uropods. *D. saldanhae* n. sp.: *c*, ventral view of epimeron 2; *d*, 5th pleon segment, telson, and uropods; *e*, marginal view of epimeron 1.

Antenna 2 short and stout, 2nd joint slightly longer than 4th, flagellum equal to 4th joint, its 2nd joint 3 times 1st.

Uropod, peduncle as broad as long, apically subquadrangular, outer ramus minute, inner ramus short, twice as long as broad, extending half-way to apex of telson.

4.25 × 1.75 mm. Pale greyish, hind margins of peraeon segments often darker, eyes dark.

Locality.—Cape Province: Saldanha Bay (K. H. B., 1912).

This species would appear to be close to, but distinct from, *orbicularis*. Budde-Lund's original description states, *inter alia*, "sublaevis" and "oculi parvi"; both of which features do not fit the present specimens.

Found under stones, sometimes, but not always, in conjunction with ants.

Diploexochus steenbrasi n. sp.

(Fig. 56, *a*, *b*.)

Similar to *saldanhae*, but peraeon segment 1 with the cleft at hind corner not so wide, internal tooth on segment 2 smaller, peraeon

segments 5-7 without inferior ridge, telson with a third elongate median tubercle distal to the 2 proximal ones, inner ramus of uropod extending $\frac{2}{3}$ to apex of telson.

3.5 × 1.5 mm. In alcohol, pale cream.

Locality.—Cape Province: Mouth of Steenbras River, south of Gordon's Bay (W. F. P.).

A species obviously allied to *saldanhae*. I have seen only one specimen.

Diploexochus nigricans (Brdt.).

(Fig. 57, a, b.)

1833. *Cubaris nigricans*. Brandt, Conspect. Onisc., p. 191 (29).
 1885. *Armadillo* „ Budde-Lund, Crust. Isop. Terr., p. 22.
 1904. „ „ *Id.*, Rev. Crust. Isop. Terr., p. 114, pl. ix,
 fig. 42.
 1910. *Diploexochus* „ Stebbing, Gen. Cat. S. Afr. Crust.,
 p. 445.

Strongly convex. Surface minutely granulate. Rugae distinct; peraeon segment 1 also with a low median boss on anterior margin, often divided into two, but sometimes almost obsolete. Epistome not strongly raised.

Peraeon segment 1, groove extending at least half-way along margin, often $\frac{2}{3}$ or $\frac{3}{4}$, hind corner not very unequally cleft, internal tooth extending nearly to hind corner, rounded; internal tooth on segment 2 well developed and prominent, but not large.

Pronotum $\frac{1}{10}$.

Usually no ridge on under-surface of epimera of segments 6 and 7, but sometimes a very slight one.

Telson distinctly broader than long, apical margin almost straight, sides incurved dorsally, with 2 low rounded tubercles proximally, followed by a low medio-longitudinal elongate tubercle; ventrally grooved only at base.

Antenna 2, 2nd and 4th joints subequal, 2nd flagellar joint 3-4 times 1st.

Uropod, peduncle slightly longer than broad, apex subquadrangular, distal outer angle very little rounded, outer ramus small, extending scarcely half-way to apex of peduncle, inner ramus short and stout, extending half-way to apex of telson.

Up to 9 × 4 mm. Dark slaty-grey or blackish, uniform but the rugae usually lighter, and the uropods often pale brownish or reddish.

Localities.—Cape Province: Cape Town and Port Elizabeth (Budde-Lund); Cape Town, slopes of Signal Hill, Devil's Peak, and Table Mt. (W. F. P., R. M. L., and K. H. B.); Riebeck Kasteel (K. H. B.); Helderberg, Somerset West (K. H. B.); Tulbagh Poort (W. F. P.); Touws River (R. M. L.); Ceres (W. F. P., R. M. L., and K. H. B.); Matjesfontein (R. M. L.); Slanghoek (W. F. P.); Brandvlei, Worcester (W. F. P.); Hottentots Holland Mts. (K. H. B.); French Hoek Pass (K. H. B.); Houw Hoek (W. F. P.); Gt. Winterhoek Mts., Tulbagh (K. H. B.); Matroosberg, Hex River Mts. (K. H. B.); Tradouw Pass, Swellendam (K. H. B.); Keeromberg, Worcester (K. H. B.); Langeberg Mts. at Garcia's Pass, Riversdale (K. H. B.); Fore Bay, near Mossel Bay (K. H. B.); Robinson Pass, Outeniqua Range (K. H. B.); Wilderness, near George (K. H. B.); Avontuur (W. F. P.).

It may be possible later when considerably more material has been obtained from intervening localities, to distinguish local varieties. Thus the Ceres specimens have the margin of peraeon segment 1 particularly well grooved; those from Keeromberg and the north side of Garcia's Pass have the rugae unusually distinct. In the Fore Bay specimens there are traces of an incipient development of tiny tubercles on pleon segments 3-5, which is definitely recognisable in the Wilderness specimens. Here there are 6 tubercles on both segments 3 and 4, and 4 on segment 5. This form, if it stood alone without the intermediate Fore Bay form, would probably be regarded as a distinct species.

At present only one form is sufficiently outstanding to merit a varietal name, viz.:

nigricans var. *major* n.

Distinguished from the typical form only by the presence of a distinct (but not strong) ridge on lower surface of epimera of segments 5-7, and by its larger size: 11 × 5 mm.

Localities.—Cape Province: Caledon (W. F. P.); Bredasdorp (R. F. L.).

Diploexochus pachytos n. sp.

(Fig. 57, c.)

Resembling *nigricans*, but with the margin of segment 1 more strongly reflexed, in consequence of which the internal convexity, culminating in the internal tooth, is very prominent. In other words, the hind part of the marginal groove, and the cleft, are much wider

than in *nigricans*. The two proximal tubercles on the telson are somewhat elongate.

8 × 4 mm. Slaty-grey, uropods often pale or reddish.

Locality.—Cape Province: Wellington Mts. (K. H. B.).

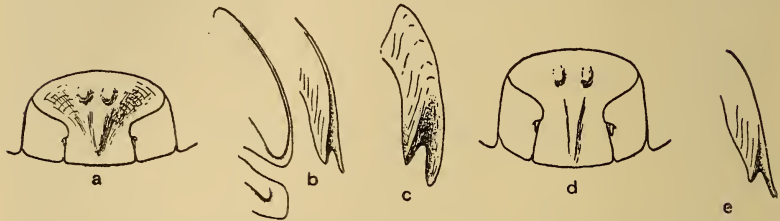


FIG. 57.—*Diploexochus nigricans* (Brdt.). *a*, Telson and uropods; *b*, ventral view of epimera 1 and 2, with marginal view of epimeron 1. *D. pachyotos* n. sp.: *c*, marginal view of epimeron 1. *D. dollfusi* n.n.: *d*, telson and uropods; *e*, marginal view of epimeron 1.

Diploexochus dollfusi nom. nov.

1895. *Armadillo nigricans*. Dollfus, Mem. Soc. Zool. Fr., viii, p. 345, fig. 1 (*non* Brandt-Budde-Lund).

Surface minutely granulate. Rugae moderately distinct. Epistome not strongly raised.

Peraeon segment 1 with marginal groove not extending so far forwards as in *nigricans*, and the hind corner more unequally cleft; internal tooth on segment 2 as in *nigricans*. Epimera of segments 6 and 7 without ridge on lower surface.

Telson only slightly broader than long, sides incurved, apical margin slightly convex, dorsally as in *nigricans*, but the basal tubercles less conspicuous, the median keel longer and more distinct.

Uropod, peduncle distinctly narrower than in *nigricans*, the distal outer angle more rounded, outer ramus minute, inner ramus longer than in *nigricans*, extending half-way to apex of telson.

Up to 7 × 3 mm. Dark slaty-grey, legs and uropods pale.

Localities.—Cape Province: Cape Flats at Wynberg and Diep River, Cape Peninsula (W. F. P.); Noordhoek Flats, Cape Peninsula (K. H. B.).

I have seen only a few specimens of this form, which is evidently the same as that figured by Dollfus, and differs from the specimens identified by Budde-Lund as *nigricans*.

Diploexochus mixtus (B.-L.).

(Fig. 58, a, b.)

1904. *Armadillo mixtus*. Budde-Lund, Rev. Crust. Isop. Terr., p. 113.

Surface minutely granulate. Rugae distinct, though not very obvious medio-dorsally. Anterior margin of segment 1 with 2 low rounded tubercles. Epistome not strongly raised.

Peraeon segment 1 with margin thick, reflexed, grooved throughout its length, hind corner unequally cleft, internal tooth rounded. Internal tooth on segment 2 well developed, somewhat oblique.



FIG. 58.—*Diploexochus mixtus* (B.-L.). a, Telson and uropods; b, ventral view of epimera 1 and 2, with marginal view of epimeron 1. *D. kogmani* n. sp.: c, ventral view of epimera 1 and 2, with marginal view of epimeron 1; d, 4th and 5th pleon segments, telson, and uropods.

Pronotum $\frac{1}{10}$ ($-\frac{1}{9}$).

Epimera of segments 5-7 and pleura of pleon segment 3 with distinct ridge on lower surface.

Telson a little broader than long, sides incurved, apical margin nearly straight, dorsally with 2 rounded tubercles proximally, followed by a medio-longitudinal rounded ridge.

Antenna 2, 4th joint slightly longer than 2nd, 2nd flagellar joint 3-4 times 1st.

Uropod, peduncle as broad as long, outer ramus small, extending one-third to apex of peduncle, inner ramus short, extending half-way to apex of telson.

9 × 4 mm. In alcohol, unicolorous yellow.

Localities.—Cape Province: Port Elizabeth (Budde-Lund); Avontuur (W. F. P.).

If these Avontuur specimens are correctly assigned to Budde-Lund's species, I would consider *mixtus* more an ally of *nigricans* than a transition between *flavescens* and *festivus*. They have no ridge on the pleura of pleon segment 3, but they are not in very good condition. The outer distal angle of peduncle of uropod is noticeably quadrate.

Diploexochus kogmani n. sp.

(Fig. 58, c, d.)

Surface minutely granulate. Rugae distinct, continuous across the dorsum. Epistome not strongly raised. Anterior margin of segment 1 with 2 median rounded tubercles. Posterior margins of segments with a second transverse series of small tubercles, appreciably smaller than those constituting the ordinary rugae. Segments divided into a smooth anterior portion and a raised posterior portion.

Pronotum $\frac{1}{10}$.

Peraeon segment 1 with margin grooved throughout its length, the groove narrow anteriorly, widening posteriorly, hind corner equally cleft, internal tooth rounded; internal tooth on segment 2 narrow, somewhat oblique.

Epimera of segments 5-7 with slight ridge on lower surface.

Pleon segments 3-5 with feeble tubercles on hind margins, and a well-marked elongate tubercle or ridge on (dorsal surface) each pleura.

Telson broader than long, sides incurved, apical margin slightly convex, dorsally with 3 tubercles, rather broad based, but low and rounded.

Antenna 2, 2nd and 4th joints subequal, 2nd flagellar joint 3-4 times 1st.

Uropod, peduncle broader than long, apex subquadrangular, outer ramus small, extending half-way to apex of peduncle, inner ramus short, broad, extending half-way to apex of telson.

6 × 2.5 mm. Slaty-grey, somewhat mottled.

Locality.—Cape Province: Kogman's Kloof, between Ashton and Montagu (K. H. B., 1922).

Closely allied to *mixtus*, but peraeon segment 1 with a narrower groove on margin, and the hind corner equally cleft, more strongly sculptured, and shape of telson different.

Diploexochus albescens B-L.

(Fig. 59, a, b.)

1909. *Diploexochus albescens*. Budde-Lund in Schultze, Reise, ii, p. 56, pl. v, figs. 29-38.

1910. " " Stebbing, Gen. Cat. S. Afr. Crust., p. 447.

Surface minutely granulate. Rugae quite distinct. Epistome not strongly raised.

Peraeon segment 1 with margin thick, grooved in posterior half, hind corner unequally cleft, internal tooth rounded; internal tooth on segment 2 subacute, oblique.

Pronotum $\frac{1}{12}$ – $\frac{1}{10}$.

Epimera of segments 4–7 with low oblique ridge on lower surface.

Telson a little broader than long, apical margin almost straight, sides slightly incurved, dorsally smooth.

Antenna 2 slender, 2nd and 4th joints subequal, 2nd flagellar joint 2–2½ times 1st.



FIG. 59.—*Diploexochus albescens* B.-L. a, Telson and uropods; b, ventral view of epimera 1 and 2, with marginal view of epimeron 1. *D. rufescens* B.-L.: c, telson and uropods; d, ventral view of epimera 1–4.

Uropod, peduncle quadrangular, outer ramus minute, inner ramus short, twice as long as broad.

Up to 14 × 7 mm. In alcohol, dirty whitish, eyes dark.

Locality.—Cape Province: Port Nolloth (Budde-Lund and R. M. L.).

The specimens collected by Lightfoot have been compared with Budde-Lund's specimens in the British Museum.

Diploexochus rufescens B.-L.

(Fig. 59, c, d.)

1909. *Diploexochus rufescens*. Budde-Lund in Schultze, Reise, ii, p. 56, pl. v, figs. 12–28.

1910. „ „ Stebbing, Gen. Cat. S. Afr. Crust., p. 447.

Surface minutely squamulose-granulose. Rugae obsolete or almost so, traceable as a series of small feeble granules. Epistome not strongly raised.

Peraeon segment 1 with margin not as thick as in *albescens*, reflexed, grooved in posterior third, hind corner unequally cleft, internal tooth rounded. Segment 2 with a thickening on anterior margin (of

epimeron), but not, or scarcely, forming a definite lamellate flange or tooth.

Pronotum $\frac{1}{10}$, sometimes $\frac{1}{9}$.

Epimera of segments 2-7 with a short, faint, slightly oblique ridge near postero-lateral corner on lower surface.

Telson a little broader than long, distal portion broader than long, sides strongly incurved, apical margin convex, dorsally convex, smooth, sometimes with very faint indications of tubercles proximally.

Antenna 2 slender, 2nd and 4th joints subequal, 1st flagellar joint unusually long, half or a trifle more than half as long as 2nd.

Uropod, peduncle longer than wide, apex subquadrate, outer ramus small, but extending nearly half-way to apex of peduncle, inner ramus very short, twice as long as broad, extending only one-quarter distance to apex of telson.

Up to 13×6.5 mm. Pale dull brownish, the epimera, hind margins of peraeon segments, and whole of pleon darker brown or slaty-greyish, eyes black, antennae pale grey, legs whitish. The contrast between the ground colour and the darker markings is less conspicuous in life than after preservation.

Localities.—Cape Province: Kamaggas (Budde-Lund); Kamieskroon (R. F. L. and A. J. H.); Hell's Kloof, Richtersveld (S.A. Mus.); Springbok and Concordia (K. H. B.); Lilyfontein, Kamiesberg (K. H. B.).

In the specimens in the Budde-Lund collection in the British Museum the 4 tubercles at the base of telson, as shown in Budde-Lund's figure, are generally absent, as they are in most of my specimens. There are, however, sometimes faint indications, and in the single specimen from Hell's Kloof (in poor condition) there are 2 distinct but small granules followed by a faint keel. Except that the telson is also shorter than usual, this specimen is otherwise quite normal.

Diploexochus coloratus n. sp.

Agreeing with *rufescens* except as follows: segments 3-7 with a slight transverse (*i.e.* to body axis) thickening or ridge on anterior portion of lower surface of epimera, in addition to the oblique ridge on the posterior portion; the peduncle of uropod is proportionately stouter, only a little longer than broad (in fact, very like Budde-Lund's fig. 27 of *rufescens*, whereas the typical *rufescens* has a uropod more like fig. 28); and the coloration.

Up to 10×4.5 mm. Ground colour pale cream or white, inner

half of epimera dark slaty-grey or blue-black, joined across the hind margins of each segment by a similar dark band, which is more or less interrupted in the middle, except on segment 1, where it forms a fairly extensive median patch; dorsal parts of pleon, and the telson dark slaty-grey; outer (marginal) parts of epimera, hind margins of each peraeon segment medio-dorsally, the pleurae of pleon segments 3-5, and the uropods suffused with clear orange. Sometimes the orange may extend over the telson, pleon, and a considerable part of the medio-dorsal area of the peraeon. Antennae pale grey, legs white.

Locality.—Cape Province: Kridouw, between Citrusdal and Clanwilliam (K. H. B., 1931).

In life this woodlouse is a most striking animal, and quite distinct from the dull brownish *rufescens*.

Diploexochus flavescens (Brdt.).

(Fig. 60, a-c.)

1833. *Cubaris flavescens*. Brandt, Conspect. Onisc., p. 191 (29).
1885. *Armadillo* „ Budde-Lund, Crust. Isop. Terr., p. 20.
1904. „ „ *Id.*, Rev. Crust. Isop. Terr., p. 111, pl. x,
fig. 5.
1910. *Diploexochus* „ Stebbing, Gen. Cat. S. Afr. Crust., p.
445.
1917. *Cubaris trilobata*. Collinge, Ann. Nat. Mus., iii, p. 575,
pl. xlii, figs. 1-9.

Surface minutely granulate. Rugae obsolete. Epistome not strongly raised.

Peraeon segment 1 with margin thick, grooved in posterior third, hind corner unequally cleft, internal tooth strong, rounded-subtruncate. Internal tooth on segment 2 well developed, narrowly rounded.

Pronotum $\frac{1}{16}$ or a little more.

Epimera of segments 5-7 with transverse, somewhat oblique, ridge on lower surface; pleura of pleon segment 3 with a similar ridge.

Telson as broad as long, sides incurved, apical margin slightly convex, dorsally slightly convex at base, and with low medio-longitudinal ridge; ventrally grooved in basal half.

Antenna 2, 2nd and 4th joints subequal, 2nd flagellar joint scarcely twice 1st.

Uropod, peduncle longer than broad, slightly narrower distally,

outer ramus extending half-way to apex of peduncle, inner ramus reaching half-way to apex of telson.

Up to 12 × 6 mm. Slaty-grey, brownish or greeny-brown, more or less mottled with lighter, antennae grey, eyes black. Young specimens are often more conspicuously mottled. Specimens in alcohol fade through a more or less variegated yellow to a uniform pale yellow or dirty cream.

Localities.—Cape Province: Cape Town and Port Elizabeth (Budde-Lund); Grahamstown (Collinge, also Albany Mus. and W. F. P.); Fort Brown (Albany Mus.); Doornnek, Alexandria Div. (S.A. Mus. ex Drege); Amatola Mts. (W. F. P.); Adelaide (S. H. H.); Zuurberg (Albany Mus.); Bushman's River (Albany Mus.); Addo Bush



FIG. 60.—*Diploexochus flavescens* (Brdt.). *a*, Ventral view of epimera 1 and 2, with marginal view of epimeron 1; *b*, telson and uropods; *c*, ventral view of epimera 5-7 and pleura of pleon segment 3. *D. festivus* (B-L.): *d*, dorsal view of uropod; *e*, telson and uropods.

(J. D.); Zwartkops, Port Elizabeth (K. H. B.); Avontuur (W. F. P.); Knysna (W. F. P.); Keurbooms River (K. H. B.).

In 1904 Budde-Lund substituted "Cape Town" for "Cape of Good Hope." I doubt whether this species has ever been found actually at Cape Town.

I have seen many specimens from Grahamstown, the type locality of *trilobata*, and find them identical with specimens from Zwartkops and other localities which have been compared with specimens in the Budde-Lund collection. The trilobed inner lobe of maxilla 1 with its 3 plumose setae (Collinge) is either an abnormality or a misinterpretation of a mounted preparation.

The telson often has the distal margin straighter than in Budde-Lund's figure, and I have seen one specimen in which it was slightly concave.

Diploexochus festivus (B-L.).

(Fig. 60, *d*, *e*.)

1904. *Armadillo festivus*. Budde-Lund, Rev. Crust. Isop. Terr., p. 112, pl. ix, figs. 40, 41.

Close to *flavescens*. Rugae present, though obscure, especially in larger specimens; peraeon segment 1 obscurely bituberculate near anterior margin in younger specimens. Internal teeth on segments 1 and 2 as in *flavescens*. Ridge on epimera of segments 5-7 present as in *flavescens*, but often obscure on pleura of pleon segment 3.

Telson a little broader than long, rather more strongly carinate than in *flavescens* and obscurely bituberculate basally.

Uropod, peduncle broader than in *flavescens*, and inner ramus shorter and stouter, extending scarcely more than one-third to apex of telson.

Up to 12 x 6 mm. Slaty-grey, more or less mottled with lighter.

Localities.—Cape Province: Port Elizabeth (Budde-Lund); Matjesfontein (W. F. P.); Montagu (W. F. P. and K. H. B.); Kogman's Kloof, Montagu (W. F. P.); Touws River (W. F. P.).

The specimens here assigned to this species have the outer distal angle of peduncle of uropod more rounded than in Budde-Lund's figure, and a somewhat shorter and stouter inner ramus. The ridge on pleura of pleon segment 3 is variable, sometimes distinct, sometimes very obscure.

Diploexochus montagui n. sp.

(Fig. 61, a, b.)

Close to *flavescens* and *festivus*, but telson broader than long and distinctly trituberculate; peduncle of uropod stouter than in

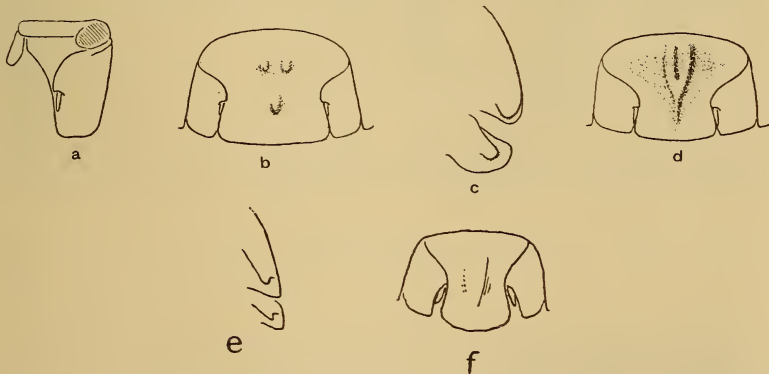


FIG. 61.—*Diploexochus montagui* n. sp. a, Dorsal view of uropod; b, telson and uropods. *D. herscheli* n. sp.: c, ventral view of epimera 1 and 2; d, telson and uropods. *D. oraniensis* (Dollf.): e, ventral view of epimera 1 and 2; f, telson and uropods (e and f after Dollfus).

flavescens, as in *festivus*. Oblique ridges on epimera of segments 5-7 and pleura of segment 3 even more distinct than in *flavescens*.

10 × 4 mm. Slaty-grey, lateral margins and uropods pale.

Localities.—Cape Province : Ashton (W. F. P.); Montagu (K. H. B., 1922).

Diploexochus oraniensis (Dollf.).

(Fig. 61, e, f.)

1895. *Armadillo oraniensis*. Dollfus, Mem. Soc. Zool. Fr., viii, p. 346, fig. 4.

1904. „ „ Budde-Lund, Rev. Crust. Isop. Terr., p. 114, pl. ix, fig. 39.

Rugae ? distinct. Peraeon segment 1 with a single inconspicuous median boss on anterior margin. Epistome not strongly raised.

Peraeon segment with epimeral margin not grooved, hind corner unequally cleft, internal tooth small. Internal tooth on segment 2 well developed.

Pronotum $\frac{1}{12}$ — $\frac{1}{10}$.

Telson a little longer than wide (in figure : very slightly wider than long), sides incurved, apical margin convex, dorsally evenly convex.

Antenna 2, 2nd flagellar joint 4 times 1st.

Uropod, peduncle longer than wide, outer ramus extending half-way to apex of peduncle, inner ramus scarcely extending more than half-way to apex of telson.

7 × 3 mm. Grey with a series of lateral clear spots, uropods red.

Localities.—Orange Free State : Bloemfontein (Dollfus).

Transvaal : Hammans Kraal, near Pretoria (Dollfus).

In having no marginal groove on segment 1 this species resembles the species of *Bethalus*, but it has a narrow pronotum (Budde-Lund, 1904, p. 102). There is certainly a great likeness to *Bethalus pretoriensis*, which has a slightly longer telson and a slightly longer outer ramus of uropod. I have seen no specimens.

Diploexochus herscheli n. sp.

(Fig. 61, c, d.)

Surface minutely granulate. Rugae feebly developed. Epistome only slightly raised.

Peraeon segment 1 with margin thin, reflexed, not grooved, hind corner nearly equally cleft, internal tooth rounded. Internal tooth on segment 2 strong.

Pronotum $\frac{1}{10}$.

Telson broader than long, sides incurved, apical margin slightly

convex, dorsally with median keel which is proximally forked; ventrally with median groove.

Antenna 2, 2nd and 4th joints subequal, 2nd flagellar joint 3-4 times 1st.

Uropod, peduncle as broad as long, apex subquadrangular, outer ramus moderate, slightly beyond half-way to apex of peduncle, inner ramus long, almost reaching to apex of telson.

4.5 × 2 mm. Slaty-grey, mottled.

Locality.—Cape Province: Majuba Nek, Herschel District (Albany Mus.).

The forked sculpture on the telson resembles that of *furcatus*, but in other respects the two species are quite distinct.

Diploexochus orphanus n. sp.

(Fig. 62, a, b.)

Surface minutely granulate. Rugae obsolete. Epistome not strongly raised, convex dorsally, concave ventrally.

Peraeon segment 1 with margin moderately thick, reflexed, narrowly grooved in posterior half, hind corner unequally and narrowly cleft,

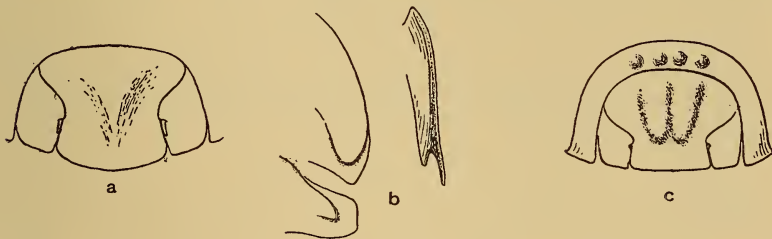


FIG. 62.—*Diploexochus orphanus* n. sp. a, Telson and uropods; b, ventral view of epimera 1 and 2, with marginal view of epimeron 1. *D. alticola* n. sp.: c, pleon segment 5, telson and uropods.

internal tooth rounded. Internal tooth on segment 2 slight, somewhat oblique and subacute.

Pronotum $\frac{1}{10}$.

Telson broader than long, apical portion broader than long, sides slightly incurved, apical margin convex, dorsally with very slight median keel.

Antenna 2, 2nd and 4th joints subequal, 2nd flagellar joint $2\frac{1}{2}$ times first.

Uropod, peduncle longer than broad, apically subquadrate, outer ramus extending half-way to apex of peduncle, inner ramus short,

twice as long as broad, extending scarcely half-way to apex of telson.

Up to 7×3 mm. Slaty-grey, head and the dorso-lateral portions of peraeon segments more or less flecked with paler.

Locality.—Cape Province: Kamiesberg (K. H. B., 1931).

This form was found on the Weeskind (Orphan) Kop, on the western edge of the Kamiesberg, overlooking Garies.

Diploexochus alticola n. sp.

(Fig. 62, c.)

Strongly convex, with low tubercles. Surface with minute squamulae (scale-spines). Head with low granules and corrugations. Eyes well developed. Epistome very feebly raised, in centre almost adnate, dorsally convex, ventrally biconcave for reception of 2nd antennae.

Peraeon segment 1 with 4 rather large, but low and rounded, tubercles or warts on anterior margin, and 2 transverse rows of smaller tubercles behind. Segments 2-7 distinctly divided into a smooth anterior portion and a raised posterior portion, each with 2 transverse rows of tubercles, the hinder row with 14-16 tubercles.

Epimeral margin of segment 1 rather thin, reflexed, grooved only at hind corner, which is unequally cleft, internal tooth rather larger than in *polythele*, rounded. Internal tooth on segment 2 moderate.

Pronotum $\frac{1}{12}$ - $\frac{1}{10}$.

Segments 5-7 with slight transverse ridge on lower surface of epimera.

Pleon segments 3-5 each with a single row of low tubercles, containing 6, 6, and 4 tubercles respectively.

Telson broader than long, posterior portion very short, sides slightly incurved, apical margin straight, dorsally strongly convex, with 2 large, but low and rounded, longitudinal ridges.

Antenna 2 short and stout, 2nd and 4th joints subequal, 2nd flagellar joint 3 times 1st.

Uropod, peduncle as broad as long, apex subquadrate, outer ramus minute, inner ramus short, twice as long as broad.

5×2 mm. Pale slaty-grey, eyes black.

Locality.—Cape Province: Zwartberg Pass, Prince Albert Div. (K. H. B., 1929).

In ornamentation and other features (epimeron of segment 1) allied to *formicarum*, but distinguished by the shape of the telson,

the feebly raised epistome, and the uropod. It differs from *polythele* by having the tubercles low and wart-like instead of conically raised.

Diploexochus rhodesiensis n. sp.

(Fig. 63, a, b.)

Strongly convex. Surface minutely squamulose-granulose. Head rugulose. Eyes well developed. Epistome not strongly raised, convex above, biconcave below.

Peraeon segment 1 with 3 large, but low and rounded, bosses in middle of anterior margin, arranged in a triangle, 2 in front and 1 behind, flanked by a similar dorso-lateral boss (often subdivided into 2), with intervening smooth areas; followed by a transverse row

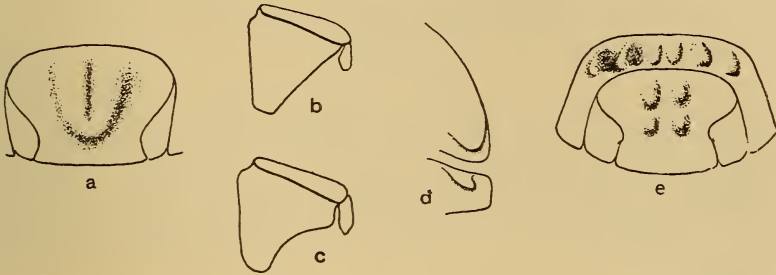


FIG. 63.—*Diploexochus rhodesiensis* n. sp. a, Telson and uropods; b, ventral view of uropod. *D. pauperculus* n. sp.: c, ventral view of uropod. *D. polythele* n. sp.: d, ventral view of epimera 1 and 2; e, pleon segment 5, telson, and uropods.

of more elongate low tubercles or rugae; posterior margin with a band of small granules.

Epimeral margin moderately thick, reflexed, grooved only in posterior third, hind corner unequally cleft, internal tooth rounded.

Segments 2-7 distinctly divided into a smooth anterior portion and a raised posterior portion, the latter with a transverse row of about 14 low tubercles, followed behind by a band of small granules.

Epimeron of segment 2 subacutely narrowed below; epimera of segments 3 and 4 less narrowed, 5-7 subquadrate, without flange or ridge on lower surface. Internal tooth on segment 2 well developed, but not or scarcely visible externally in lateral view.

Pronotum $\frac{1}{1\frac{1}{2}}$.

Pleon segments 3-5 granulate, without larger tubercles.

Telson $1\frac{1}{2}$ times as broad as long, posterior portion very short, sides incurved, apical margin nearly straight, dorsally with a large

boss covered with small granules and with a medio-longitudinal groove.

Antenna 2 short and stout, 2nd and 4th joints subequal, 2nd flagellar joint 3 times 1st.

Uropod, peduncle as long as broad, strongly but evenly narrowed to a truncate apex, inner margin straight, outer ramus obsolete, inner ramus short, twice as long as broad.

Up to 5×2.25 mm. Pale slaty-grey, rugae lighter, eyes dark.

Localities.—Rhodesia: Bulawayo and Salisbury (R. W. E. T.).

Damaraland: Namutoni (K. H. B., 1921).

Great Namaqualand: Nakob (K. H. B., 1925).

The Rhodesian specimens were found in the nests of *Pheidole* ants.

Diploexochus pauperculus n. sp.

(Fig. 63, c.)

Very like *rhodesiensis* except as follows: peraeon segment 1 with only the 2 foremost bosses on anterior margin; sculpturing in general feebler, and the hind margins of the peraeon segments not distinctly granulate; peduncle of uropod slightly longer than broad, narrowing to a rounded apex, inner margin concave, inner ramus relatively larger.

5×2 mm. Pale slate-grey, rugae lighter.

Locality.—Cape Province: Fore Bay, near Mossel Bay (K. H. B., 1931).

Found under stones and logs, sometimes in association with ants.

Diploexochus polythele n. sp.

(Fig. 63, d, e.)

Strongly convex and tuberculate. Surface with minute squamulae. Head with 3 transverse rows of conical tubercles, with 8 (or 10), 6, and 4 tubercles in front, middle, and hind row respectively. Eyes well developed. Epistome not strongly raised, convex above, bi-concave below.

Peraeon segment 1 with 4 transverse rows of 4, 3, 14, and 10 conical tubercles respectively, the tubercles of the anterior two and of the posterior two rows alternating. Segments 2-7 distinctly divided into a smooth anterior portion and a raised posterior portion, each segment with 2 rows of about 10 tubercles each, alternating, more or less elongate, especially those of the hinder row on each segment.

Epimeral margin of segment 1 moderately thick, reflexed, grooved only in its hinder third, hind corner unequally cleft, internal tooth rounded. Internal tooth on segment 2 moderate.

Pronotum $\frac{1}{12}$ — $\frac{1}{10}$.

Segments 5–7 without ridge on lower surface of epimera.

Pleon segments 3–5 each with a single row of tubercles, respectively 8, 8, 6, the outermost one on segments 3 and 4 being situate on the pleurae.

Telson broader than long, distal portion very short, sides feebly incurved, apical margin nearly straight, dorsally with 4 tubercles *en caré*.

Antenna 2 short and stout, 2nd and 4th joints subequal, 2nd flagellar joint 3 times 1st.

Uropod, peduncle about as broad as long, narrowing to the subquadrate apex, outer ramus obsolete, inner ramus short, twice as long as broad.

4.5 × 1.75 mm. Pale slaty-grey, eyes black.

Locality.—Cape Province: Zwartberg Pass, Prince Albert Div. (K. H. B., 1929).

In ornamentation this species is comparable with *regulus* van Name, 1920, from the Belgian Congo.

Diploexochus meiringi n. sp.

(Fig. 64, a.)

Convex and tuberculate. Surface with minute squamulae. Head with 2 transverse rows of tubercles low rounded, 5 in each row. Eyes well developed. Epistome not strongly raised.

Peraeon segment 1 with 2 transverse rows of low rounded tubercles, 6 in anterior row, the two median ones largest, and 8 in posterior row. Segments 2–7 distinctly divided into a smooth anterior part, and a raised posterior portion, the latter with a transverse row of 16 somewhat longitudinally elongate tubercles, the outermost ones being on the epimera.

Epimeral margin of segment 1 moderately thick, reflexed, grooved along its whole length, hind corner unequally cleft. Internal tooth on segment 2 somewhat narrow and oblique.

Pronotum $\frac{1}{12}$ — $\frac{1}{10}$.

Segments 5–7 with very faint transverse ridges.

Pleon segments 3 and 4 each with 2 rounded tubercles set far apart near junction with pleura, less far apart on segment 4 than on seg-

ment 3; segment 5 with 4 tubercles. The tubercles on segments 3 and 4 together with the outer ones on segment 5 are in two converging lines conforming with the narrowing of the segments. Each pleura with a rather elongate tubercle.

Telson broader than long, distal portion very short, sides feebly or not at all incurved, apical margin nearly straight, dorsally with 3 conical tubercles.

Antenna 2 short and stout, 2nd and 4th joints subequal, 2nd flagellar joint 3 times 1st.

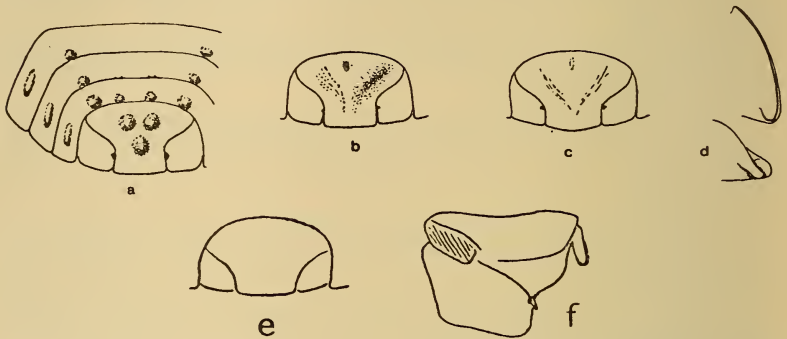


FIG. 64. *Diploexochus meiringi* n. sp. a, Pleon segments 3-5, telson and uropods. *D. alberti* n. sp.: b, telson and uropods. *D. tugelae* n. sp.: c, telson and uropods; d, ventral view of epimera I and 2. *D. pusillus* B.-L.: e, telson and uropods; f, dorsal view of uropod. (e and f after Budde-Lund.)

Uropod, peduncle about as broad as long, narrowing to the subquadrate apex, outer ramus minute, inner ramus scarcely twice as long as broad.

5 × 2 mm. Slaty-grey, somewhat rufous on the epimera and pleura, uropods reddish.

Locality.—Meiring's Poort Berg, Zwartberg Range, 6900 ft. (K. H. B., 1932).

Closely allied to *polythele* but with a different arrangement of tubercles, and epimeron of segment 1 grooved throughout its length. The latter feature is found in *alberti*, which, however, is an almost smooth species, the telson in particular showing no trace of any tubercles.

Diploexochus alberti n. sp.

(Fig. 64, b.)

Strongly convex. Surface minutely granulate. Rugae faintly indicated. Eyes well developed. Epistome not strongly raised.

Peraeon segment 1 with margin thick, grooved throughout its length, hind corner equally cleft, internal tooth rounded. Internal tooth on segment 2 well developed, the epimeron narrowed below.

Pronotum $\frac{1}{12}$ — $\frac{1}{10}$.

Segments 5–7 without ridge on lower surface of epimera.

Telson about $1\frac{1}{2}$ times as broad as long, distal portion short, subquadrangular, apical margin straight, dorsally medianly convex, with a faint median impression proximally.

Antenna 2 short and stout, 2nd and 4th joints subequal, 2nd flagellar joint 3 times 1st.

Uropod, peduncle a little broader than long, apically subquadrangular, outer ramus minute or obsolete, inner ramus short and stout, twice as long as broad.

6 × 2.25 mm. Slaty-grey, uropods pale reddish.

Localities.—Cape Province: Zwartberg Pass, 5500 ft., Prince Albert Div. (K. H. B., 1929); Meiringspoort Berg, Zwartberg Range, 6900 ft. (K. H. B., 1932).

This form does not appear to be referable to *orbicularis*, as the eyes are by no means small, and the peduncle of uropod is distinctly broader than long.

Diploexochus tugelae n. sp.

(Fig. 64, c, d.)

Surface minutely granulose. Rugae obsolete. Epistome not strongly raised. Eyes well developed.

Peraeon segment 1 with margin grooved throughout its length, hind corner subequally cleft, internal tooth rounded. Internal tooth on segment 2 well developed, oblique.

Pronotum $\frac{1}{12}$ — $\frac{1}{10}$.

Telson broader than long, distal portion very short, sides straight, apical margin slightly convex, dorsally smooth, with a very faint median impression proximally.

Antenna 2 short and stout, 2nd flagellar joint 4 times as long as the very short 1st.

Uropod, peduncle as broad as long, apically subquadrate, outer ramus minute, inner ramus extending almost to apex of telson.

3 × 1 mm. Greyish-white, eyes black.

Locality.—Natal: Krantz kop (K. H. B., 1917).

Differs from *pusillus* in the elongate inner ramus of uropod.

Found in ants' nests under stones. Krantz kop is near the south bank of the Tugela River, which divides Natal from Zululand.

Diploexochus pusillus B-L.

(Fig. 64, e, f.)

1909. *Diploexochus pusillus*. Budde-Lund in Schultze, Reise, ii,
p. 57, pl. v, figs. 39-43.
1910. „ „ Stebbing, Gen. Cat. S. Afr. Crust.,
p. 447.
?1924. „ „ Panning, Beitr. Kennt. Land. Süß-
wasserf. S.W. Afr., ii, p. 167.

Eyes small, ocelli 14. Epistome not strongly raised.

Peraeon segment 1 with margin thick, grooved for its entire length, hind corner subequally cleft.

Pronotum and internal tooth on segment 2 ?

Telson short, almost twice as wide as long, sides slightly incurved, apical margin nearly straight.

Antenna 2, 2nd and 4th joints subequal, 2nd flagellar joint 3 times 1st.

Uropod, peduncle much wider than long, outer ramus minute, inner ramus very small, twice as long as wide, only about $\frac{1}{3}$ length of peduncle.

3.5 × 1.6 mm. Unicolorous reddish-brown.

Localities.—Cape Province: Cape Flats, near Cape Town (Budde-Lund).

Great Namaqualand: Lüderitzbucht (Panning).

A comparison of Panning's and Budde-Lund's specimens would be useful. As some of the characters were not included in Budde-Lund's description, the identity of Panning's specimens is, to say the least, doubtful.

Diploexochus tabularis n. sp.

(Fig. 65, a-e.)

Surface minutely granulose. Rugae distinct but not prominent, more prominent on segment 7 than anteriorly. Two inconspicuous bosses on anterior margin of segment 1.

Eyes small, 2-3 ocelli. Epistome not strongly raised, a slight median impression above, biconcave below, the junction of the two areas marked by a rather distinct arcuate line.

Peraeon segment 1 with margin grooved throughout its length, but the groove often difficult to trace, hind corner unequally cleft, internal tooth rounded and projecting beyond the true postero-lateral corner of segment, consequently visible externally in lateral view.

Epimeron of segment 2 narrowed to a subacute point, internal tooth well developed, visible externally behind the epimeron in lateral view.

Pronotum $\frac{1}{12}$ — $\frac{1}{10}$.

Segments 2-7 distinctly divided into a smooth anterior portion and a raised posterior portion. Epimera of segments 5-7 with thickening on lower surface near anterior margin.



FIG. 65.—*Diploexochus tabularis* n. sp. *a*, Telson and uropods; *b*, external lateral view of segments 1-3; *c*, dorsal view of uropod; *d*, frontal view of head; *e*, marginal view of epimeron 1. *D. ecaudatus* n. sp.: *f*, marginal view of epimeron 1. *D. albanyensis* n. sp.: *g*, marginal view of epimeron 1. *D. hypselos* n. sp.: *h*, pleon segment 5, telson and uropods; *i*, dorsal view of uropod; *j*, external lateral view of head and peraeon segments 1-4; *k*, frontal view of head; *l*, marginal view of epimeron 1.

Telson twice as broad as long, distal portion extremely short, apical margin nearly straight, dorsally tumid with a faintly indicated medio-longitudinal impression proximally.

Antenna 2 short and stout, 2nd flagellar joint 3-4 times 1st.

Uropod, peduncle much broader than long, subquadrangular, outer ramus obsolete, inner ramus extending to apex of telson and very nearly to level of apex of peduncle.

3 × 1.25 mm. White, eyes black.

Locality.—Cape Province: Table Mt., Cape Town, lower and upper slopes (K. H. B.).

Although found in a locality so close to where *pusillus* was found, I do not think these specimens can be identical with Budde-Lund's

species. He would surely have remarked on the prominent size of the internal teeth on segments 1 and 2 if they were of the same form as here; in fact he says of the 1st peraeon segment "post subaequaliter fisso." Here the hind corner is certainly not subequally cleft. Further, the uropod differs from his figure, and there are fewer ocelli in the eyes. Budde-Lund does not mention the width of the pronotum.

Found among humus and damp leaves, and in ants' nests under stones, from an altitude of about 1000 ft. up to 3000 ft.

Diploexochus ecaudatus n. sp.

(Fig. 65, f.)

Resembling *tabularis* except as follows: ocelli 4 (-5); rugae and tubercles slightly more prominent, on the posterior segments indistinctly divided into two transverse series, with the tubercles alternating in the 2 series; margin of peraeon segment 1 grooved only at hind corner; pleon segments 3-5 with just a hint of tuberculation.

2.75 × 1 mm. Whitish, eyes black.

Localities.—Cape Province: Zwartberg, Caledon (K. H. B., 1918); River Zonder End Mts. (K. H. B., 1928); Langeberg Mts., at Riversdale (K. H. B., 1926).

The specific name may refer to the very short telson, which the species has in common with its allies, and to the "River without End" mountain range. Although the Caledon Zwartberg is now separated from the River Zonder End range, it appears to have been connected with it in the past more intimately than with other mountain massifs. A considerable gap occurs between the River Zonder End and Langeberg ranges; the nearest approximation occurring at Swellendam. No specimens have yet been obtained from the Swellendam area of the Langeberg.

Diploexochus albanyensis n. sp.

(Fig. 65, g.)

Resembling *tabularis* and *ecaudatus* except as follows: all surface sculpturing more rugged; ocelli 5; both the dorsal marginal line and the transverse line across front of epistome more strongly marked and arcuate; rugae and tubercles more strongly developed than in *ecaudatus*; 2 distinct rows of alternating tubercles on each segment, there being 6 tubercles (no median one) in anterior row, and 5 in posterior row, not counting the tubercle at junction of each epimeron and its segment; margin of segment 1 scarcely grooved, but deeply

and widely cleft at hind corner; pleon segments 3-5 each with a transverse series of 3 distinct tubercles (1 median and 1 dorso-lateral on either side); telson with 2 submedian tubercles proximally.

3 × 1.25 mm. In alcohol, greyish, eyes black.

Localities.—Cape Province: Katberg Forest (J. Hewitt, Albany Mus.); Grahamstown (J. Hewitt, Albany Mus.).

Diploexochus hypselos n. sp.

(Fig. 65, *h-l*.)

Resembling *tabularis*, *ecaudatus*, and *albanyensis* except as follows: ocelli not traceable; head, peraeon, and pleon with strong mamilliform tubercles; in 2 series on head and peraeon segments, with 2 median bosses in addition on anterior margin of segment 1; anterior row on peraeon segments with 4 (no median tubercle) and posterior row with 5, not counting the tubercle at junction of epimera and segments; margin of segment 1 thick, but not actually grooved, hind corner widely and unequally cleft; when the animal is completely rolled up, the epimera of both segments 2 and 3 fit into this cleft; internal tooth on segment 2 obsolete, in consequence of the pushing forward of the 3rd epimeron; pleon segments 3-5 each with a single series of tubercles, 2, 4, and 4 respectively, the 2 on segment 3 being especially large (like those on the peraeon); telson more than twice as wide as long, distal portion very short and narrow, dorsally with 3 tubercles, 2 being submedian proximally, the third median on the apical margin, occupying the whole of the distal portion of the telson; antenna 2, peduncle very short and stout, with flagellum only one-third width of 5th joint, shorter than 5th joint, its 2nd joint 3 times 1st; peduncle of uropod as long as broad, the inner basal surface projecting inwards, outer ramus obsolete, inner ramus short, not reaching apex of telson.

3 × 1.25 mm. Creamy-white.

Locality.—Natal: Krantzkop (K. H. B., 1917).

This is the most remarkable species of the *tabularis* group. The suppression of the internal tooth on segment 2 in response to the pushing forward of segment 3 appears to be unique. The telson and uropod are also noteworthy.

In ants' nests under stones. The dorsal sculpturing is not unlike the highland country in the district where this little woodlouse was found.

Diploexochus pubescens (B-L.).

(Fig. 66, a-d.)

1885. *Armadillo pubescens*. Budde-Lund, Crust. Isop. Terr., p. 287.
 1904. " " *Id.*, Rev. Crust. Isop. Terr., p. 114.
 1910. *Diploexochus* " Stebbing, Gen. Cat. S. Afr. Crust.,
 p. 446.

Strongly convex. Surface distinctly granulate and covered with rather long bristle-like scale-spines. Rugae distinct, and in addition a series of larger granules along hind margins of peraeon segments, covered, however, by the smaller granules and hairs like the rest of the surface.

Eyes well developed. Epistome not strongly raised, convex and minutely granulate above, smooth and concave below.

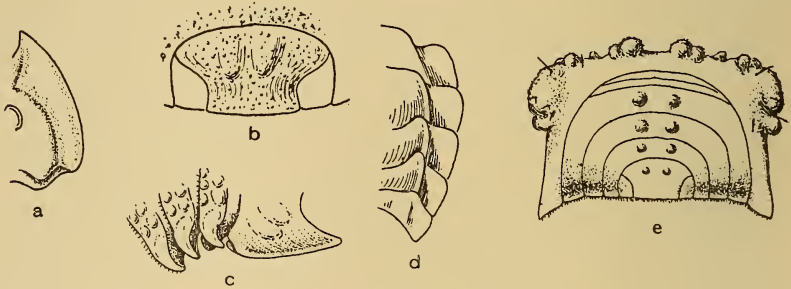


FIG. 66.—*Diploexochus pubescens* (B-L.). a, Ventral view of epimeron 1; b, telson and uropods; c, external lateral view of peraeon segments 1-3; d, ventral view of epimera 5-7 and pleurae 3 and 4. *D. conisaleus* n. sp.: e, hind view of 7th peraeon segment, pleon, and telson.

Peraeon segment 1 with a large, but low, wart-like median tubercle on anterior margin, flanked by a similar but longitudinally elongate one on either side (with intervening smooth area), posterior margin with a series of numerous rounded tubercles. Peraeon segments 2-7 divided into a smooth anterior portion and a raised posterior portion, the latter with 2 transverse rows of tubercles, 14-16 in each row.

Epimeral margin of segment 1 strongly reflexed, not grooved, hind corner subequally cleft, internal tooth rounded. Epimera 2-4 narrowed below to subacute points; internal tooth on segment 2 large, rounded, projecting backwards, visible externally in lateral view, and forming with the apex of its epimeron a cleft into which the 3rd epimeron fits.

Segments 5-7 and pleon segments 3 and 4 with a strong longi

tudinal (parallel with body axis) flange on lower surface, external to which the epimera and pleurae are bent outwards more or less horizontally; the flange is faint on segment 4.

Pronotum $\frac{1}{8}$ - $\frac{1}{7}$.

Telson twice as broad as long, distal portion very short, sides scarcely incurved, apical margin straight, dorsally convex and slightly tumid proximally, with faint indication of a median groove.

Antenna 2 stout, 2nd and 4th joints subequal, 2nd flagellar joint 3 times 1st.

Uropod, peduncle longer than broad, apex subquadrangular, outer ramus minute or obsolete, inner ramus $2\frac{1}{2}$ to nearly 3 times as long as wide, extending about half-way to apex of telson.

Up to 11×4.5 mm. Dirty whitish, eyes dark; usually covered with particles of earth.

Localities.—Cape of Good Hope (Budde-Lund).

Cape Province: Grahamstown and environs (Albany Mus.); Kasouga (Albany Mus.).

Natal: Stella Bush, Durban (K. H. B., 1912).

There can be little doubt that this is Budde-Lund's *pubescens*, although he makes no mention of surface sculpturing; in a small specimen this is not too obvious and is more or less concealed by the distinctive hirsute covering. In the following species (*conisaleus*), on the other hand, the tubercles are more prominent, especially those on peraeon segment 7, even in a specimen equal in size to Budde-Lund's specimen, and could not have been overlooked by him.

The only feature in which these specimens appear to differ from Budde-Lund's description is in the epistome, which was originally described as "frontem multo superante." By comparison with other species the epistome cannot be described as strongly raised above the dorsal surface of the head.

The single original specimen was collected by Drege at the "Cape of Good Hope" (see p. 179). In 1904 Budde-Lund substitutes the exact locality "Cape Town" without any justification.

Diploexochus conisaleus n. sp.

(Fig. 66, e.)

Closely resembling *pubescens*, but distinctly and strongly tuberculate. Surface more squamulose than granulose, and with longer and more hair-like scale-spines; the hind margin of each peraeon segment, however, is clothed with much shorter, bristle-like, scale-spines.

Head with numerous low tubercles. Epimera and pleurae of segments 3 and 4 as in *pubescens*. Peraeon segments 1 and 2-6 as in *pubescens*.

Segment 7 with 2 large rounded submedian tubercles, composed of 2-4 more or less confluent tubercles, and dorso-laterally a relatively enormous rounded boss on each side.

Pleon segments 3-5 each with 2 submedian rounded tubercles.

Telson in shape like that of *pubescens*, but with 2 submedian rounded tubercles proximally, continuing the line of those on pleon segments 3-5.

Antenna 2 and uropod as in *pubescens*, the latter with minute outer ramus.

Up to 9 × 4 mm. Dirty white, eyes dark; usually covered with particles of earth, so that the sculpture is only seen properly in a freshly moulted specimen.

Locality.—Natal: Inchanga (K. H. B., 1917).

Closely allied to *pubescens* but quite easily distinguished.

Young taken from the brood-pouch are devoid of both tubercles and the hair-like scale-spines. Specimens 2.5 mm. long are tuberculate, but without the conspicuous bosses on segment 7, and are more thickly covered with long hairs than the adults; at 5 mm. these bosses are prominently developed.

Found under stones, with or without ants' nests, and among dead leaves and humus.

Diploexochus makuae n. sp.

(Fig. 67.)

Surface minutely squamulose-granulose. Rugae moderately distinct, but not continuous across dorsum. Epistome strongly raised, convex above, dorso-lateral angles quadrate.

Peraeon segment 1 with margin thick, reflexed, grooved for almost its entire length, hind corner unequally cleft, internal tooth broadly rounded. Internal tooth on segment 2 strong, not adjacent to anterior margin, transverse, subquadrate.

Pronotum $\frac{1}{8}$ - $\frac{1}{7}$.

Segments 3-7 each with transverse ridge anteriorly on lower surface of epimera, and a short longitudinal (parallel to body axis) ridge posteriorly, the latter well marked only on segments 5-7.

Telson broader than long, sides incurved, apical margin nearly straight, dorsally gently convex, with a faint median impression (naked) near base; ventrally with median groove basally.

Antenna 2 short and stout, 2nd and 4th joints subequal, 2nd flagellar joint 3 times 1st.

Uropod, peduncle longer than broad, apex subquadrate, outer ramus minute, inner ramus moderate, 3 times as long as wide, extending two-third distance to apex of telson.

7 × 3 mm. Slaty-grey, mottled with paler.

Locality.—Portuguese East Africa : Masiene (R. F. L.).

Closely similar to *salisburyensis* and *obliquidens* in several features, but distinguished by the strong internal tooth on segments 1 and 2,

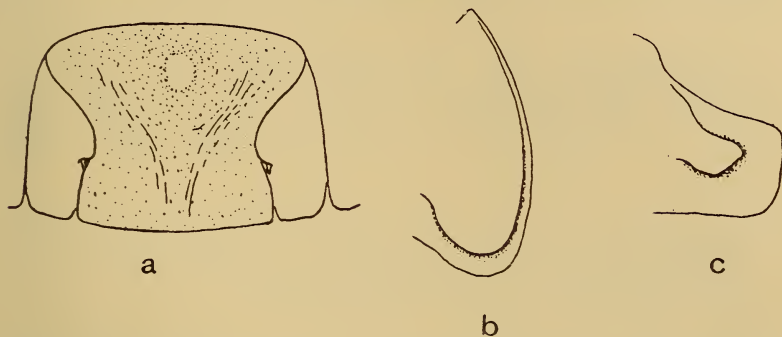


FIG. 67.—*Diploexochus makuae* n. sp. a, Telson and uropods; b, c, ventral view of epimera 1 and 2.

broader pronotum, and the presence of the longitudinal ridges on lower surface of epimera 3-7.

The rugae of the woodlouse resemble the parallel series of raised cicatrices with which the members of the Makua tribe ornament their faces and bodies.

Diploexochus limenites n. sp.

(Fig. 68, a-c.)

Surface minutely granulate. Rugae on head and peraeon obsolete. Epistome not strongly raised, slightly impressed in front medio-dorsally.

Peraeon segment 1 with margin thin, reflexed, feebly grooved for one-third its length, hind corner very unequally cleft, internal tooth rounded. Internal tooth on segment 2 small, near the anterior margin.

Pronotum $\frac{1}{8}$ - $\frac{1}{7}$.

Segments 5-7 without thickening on lower surfaces of epimera.

Pleurae of pleon segments 4 and 5 with a slight transverse ridge on lower surface ; a similar, but less conspicuous ridge on segment 3 also.

Telson slightly broader than long, apical margin slightly convex, sides incurved, dorsally with 2 faint ridges basally, converging posteriorly (with a minute tubercle between them), followed by a faint short medio-longitudinal ridge ; ventrally without any median groove ; margin above bases of uropods somewhat tumid.

Antenna 2 slender, 2nd and 4th joints subequal, 2nd flagellar joint twice 1st (sometimes scarcely twice).

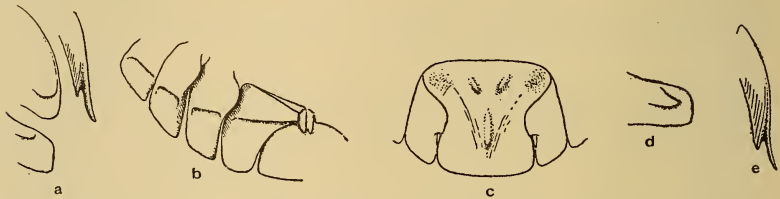


FIG. 68.—*Diploexochus limenites* n. sp. *a*, Ventral view of epimera 1 and 2, with marginal view of epimeron 1 ; *b*, ventral view of pleurae of segments 3-5, uropod, and telson ; *c*, telson and uropods. *D. hypsinephes* n. sp. ; *d*, ventral view of epimeron 2 ; *e*, marginal view of epimeron 1.

Uropod, peduncle apically subquadrangular, ventral surface with a slight transverse ridge, outer ramus short, extending half-way to apex of peduncle, inner ramus very short.

Up to 13×6.5 mm. In alcohol, faded to a uniform cream.

Locality.—Cape Province : Mossel Bay (W. F. P.).

This species and the next one are distinguished from all other South African species by the transverse ridges on lower surface of the pleurae of pleon segments (3) 4 and 5, and the peduncle of uropod.

Diploexochus hypsinephes n. sp.

(Fig. 68, *d*, *e*.)

Differing from *limenites* only in having a distinct groove on peraeon segment 1, extending half-way along margin, the internal tooth on segment 2 stronger, nearer the middle of epimeron, and apically subacute.

Up to 15×7.5 mm. Slaty-grey, more or less mottled with pale cream.

Localities.—Cape Province : Zwartberg Range, at Seven Weeks Poort Berg (Ladismith) ; and the Zwartberg Pass (Prince Albert), 4000-5000 ft. (K. H. B., 1928, 1929).

This form is very close to *limenites*, but the differences are quite clear when specimens of the two forms are laid side by side. Moreover, the respective localities are widely separate, though the intervening country, including the Outeniqua Range, has not yet been searched.

Diploexochus zwartbergensis n. sp.

Distinguished from *nigricans* by the broader pronotum ($\frac{1}{8}$ – $\frac{1}{7}$), the feebler groove on peraeon segment 1, extending only one-third along margin, and the presence of a distinct ridge down the centre of the pleurae of pleon segments 3–5.

8 × 4 mm. Slaty-grey, uropods usually reddish or orange.

Localities.—Cape Province: Zwartberg Range, at Seven Weeks Poort Berg (Ladismith); and the Zwartberg Pass (Prince Albert), (K. H. B., 1928, 1929).

Diploexochus nebulosus n. sp.

(Fig. 69, b, c.)

Resembling *nigricans* very closely, and *dollfusi* still more closely, but distinguished by the broader pronotum and the straight sides of the distal part of telson.

Peraeon segment 1 with margin as in *dollfusi*. Median ridge on telson is quite distinct from the 2 proximal tubercles, not in any way joined to them as it is in *furcatus*.

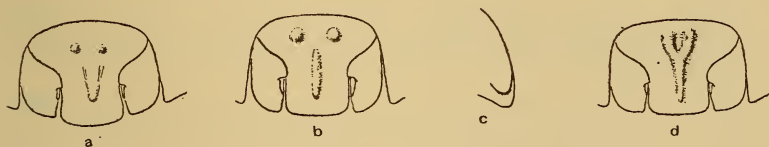


FIG. 69.—*Diploexochus disjunctus* n. sp. a, Telson and uropods. *D. nebulosus* n. sp.: b, telson and uropods; c, ventral view of epimeron I (that of *disjunctus* is similar). *D. furcatus* n. sp.: d, telson and uropods.

Peduncle of uropod as broad as long, but narrowed distally, outer distal angle rounded, outer ramus extending half-way to apex of peduncle, inner ramus extending half-way to apex of telson.

6 × 2.5 mm. Slaty-grey, sometimes mottled, uropods often pale.

Localities.—Cape Province: Langeberg Range, at Swellendam and Zuurbrak (K. H. B., 1925).

Diploexochus furcatus n. sp.

(Fig. 69, d.)

Resembling *nigricans* and *dollfusi*, except as follows: margin of peraeon segment 1 thin, grooved only in its posterior third, hind corner unequally cleft; internal tooth on segment 2 smaller and less prominent; pronotum $\frac{1}{2}$; telson with sides feebly incurved, the 2 basal tubercles and the distal median ridge united to form a Y-shaped ridge; inner ramus of uropod longer, extending two-thirds to apex of telson.

5 × 2 mm. Slaty-grey, uropods pale.

Localities.—Cape Province: Palmiet River Mts., Kleinmond (K. H. B., 1927); River Zonder End Mts. (K. H. B.).

The Y-shaped ridge on telson is somewhat like that of *herscheli*, q.v.

Some very similar specimens (S.A. Mus., No. A 7993) were found on Keeromberg, Worcester District, in association with *nigricans*. They are rather less strongly rugulose, the fork on the telson less marked, the tooth on peraeon segment 2 more adnate, and the inner ramus of uropod shorter. Without more material from intervening localities I hesitate either to assign these specimens to *furcatus*, or to regard them as another new species.

Diploexochus disjunctus n. sp.

(Fig. 69, a, c.)

Surface minutely granulate. Rugae distinct. Anterior margin of peraeon segment 1 with 2 feeble rounded tubercles. Epistome not strongly raised.

Peraeon segment 1 with margin thin, grooved only at hind corner which is unequally cleft, internal tooth rounded. Internal tooth on segment 2 rather small, not prominent.

Pronotum $\frac{1}{6}$ – $\frac{1}{5}$.

Telson broader than long, sides incurved, apical margin convex, dorsally with 2 conical tubercles proximally and a median elongate or conical tubercle distally.

Antenna 2, 2nd and 4th joints subequal, 2nd flagellar joint 3 times 1st.

Uropod, peduncle slightly longer than wide, distally narrowed, outer distal corner rounded, outer ramus small, extending half-way to apex of peduncle, inner ramus short, extending half-way to apex of telson.

7 × 3.25 mm. Slaty-grey, sometimes mottled, and uropods sometimes pale.

Localities.—Cape Province: Langeberg Range, at Riversdale (east of Garcia's Pass) and Lemoenshoek (K. H. B., 1926, 1927).

Near to *furcatus* but with slightly broader pronotum and the median tubercle on telson quite separate from the 2 basal ones. The resemblance to *Bethalus limbatus* is very close, but the size and position of the internal tooth on segment 1 is an easy mark of distinction.

Diploexochus castor n. sp.

(Fig. 70.)

Surface minutely squamulose. Rugae tubercular. Head dorsally with 3 transverse rows of rounded tubercles. Epistome not strongly raised.

Peraeon segment 1 with 4-5 transverse rows of rounded or somewhat longitudinally elongate tubercles, the rows not always clearly



FIG. 70.—*Diploexochus castor* n. sp. a, Pleon segments 4 and 5, telson and uropods of ♂; b, the same of ♀; c, ventral view of epimera 1 and 2.

distinct from one another, about 12-14 tubercles in each row. Segments 2-7 divided into an anterior smooth portion and a raised posterior portion, the latter with 3 transverse rows of tubercles, the hindermost row of each segment on the hind margin, which thus has a scalloped appearance. Upper surface of epimera of segments 2-7 each with 1-3 tubercles.

Epimeral margin of segment 1 not thick, reflexed, grooved in posterior half, but the groove faintly traceable to about two-thirds length, hind corner unequally cleft, internal tooth rounded. Internal tooth on segment 2 small, oblique, subacute.

Segments 3-7 with a slight transverse (to body axis) ridge on lower surface of epimera.

Pronotum $\frac{1}{3}$.

Pleon segments 1-5 each with a single transverse row of tubercles on hind margin, respectively 6, 8, 10, 8, and 6 in number, and an elongate tubercle or ridge on each pleura.

Telson in ♂ nearly half as long again as wide, sides strongly incurved, apical margin strongly convex, dorsally with 2 rounded tubercles at base followed by a median elongate tubercle or short ridge, all three often very indistinct; in ♀ broader than long, sides strongly incurved, apical margin convex, postero-lateral angles rounded, dorsally with 2 submedian rounded tubercles near base, followed by a median elongate tubercle or short ridge.

Antenna 2, 2nd and 4th joints subequal, 2nd flagellar joint 3 times 1st.

Uropod, peduncle longer than broad, outer distal angle rounded, outer ramus extending half-way to apex of peduncle, inner ramus short, 2-2½ times as long as broad, extending in ♂ one-quarter, in ♀ barely half-way, to apex of telson.

Up to 8 × 3 mm. Slaty-grey, sometimes with lighter mottling, lateral margins of peraeon, pleon, and apex of telson yellowish, eyes black, antennae grey, legs pale.

Localities. — Cape Province: Lilyfontein and Modderfontein, Kamiesberg (K. H. B., 1931).

Klipvlei, near Garies (A. J. H. and C. T., 1931).

The dorsal sculpture varies somewhat. In most of the ♀♀ the tubercles are strong, either low and rounded or sharply conical; in a few ♀♀, however, they are feebly developed. In most of the ♂♂, on the other hand, the reverse is the case, though some younger ♂♂ are as strongly tuberculate as the ♀♀.

The remarkable development of the telson in the ♂ seems to occur only in fully grown ♂♂, smaller ones resembling the ♀. As there are no structural differences, except the telson and the usually stronger sculpturing of the ♀, and as both forms were found together under the same stones, there is no question that only one, sexually dimorphic, species is present. The telson of the ♂ strongly resembles a beaver's tail.

Diploexochus celsicauda n. sp.

(Fig. 71.)

Surface minutely granulate. Rugae feebly indicated. Epistome not strongly raised, in fact scarcely raised at all in the middle.

Peraeon segment 1 with margin not very thick, grooved in posterior third, hind corner unequally cleft, internal tooth rounded. Internal tooth on segment 2 near anterior margin, slight.

Pronotum $\frac{1}{8}$ – $\frac{1}{7}$.

Telson in ♂ considerably longer than broad, distal portion shield-shaped, sides incurved, apical margin with median point, with the margin on either side straight, dorsally with a high medio-longitudinal keel beginning a short distance from base; in ♀ broader than long, sides incurved, apical margin with a slight point, margin on either side nearly straight, dorsally with a slight medio-longitudinal ridge, not extending above the general level of the dorsal profile.

Antenna 2 slender, 2nd and 4th joints subequal, 2nd flagellar joint twice 1st.

Uropod, peduncle in ♂ longer than broad, in ♀ as broad as long, apically subquadrate, outer ramus extending half-way to apex of

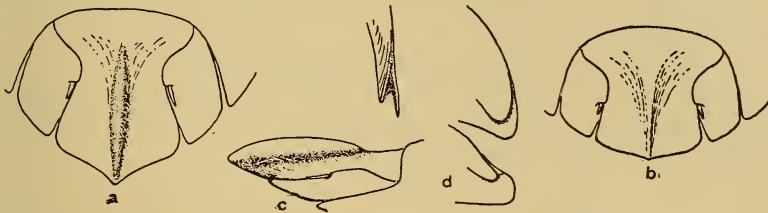


FIG. 71.—*Diploexochus celsicauda* n. sp. a, b, Telson and uropods of ♂ and ♀ respectively; c, lateral view of telson and uropod of ♂; d, ventral view of epimeron 1 and 2, with marginal view of epimeron 1.

peduncle, inner ramus short, twice as long as broad, extending in ♀ one-third distance to apex of telson.

Up to 11.5 (♂), 11 (♀), × 4.5 mm. Uniform straw-colour or buff, hind margins of peraeon segments sometimes (especially in preserved specimens) somewhat darker, eyes black, antennae greyish-brown, legs pale.

Localities.—Cape Province: Van Rhyns Dorp and Bitterfontein (K. H. B., 1931); Garies (A. J. H., 1930).

This species, like *castor*, is remarkable for the sexual dimorphism. In ♂ of 4 mm. length the telson is like that of the ♀ with a slightly stronger median ridge; at 5 mm. the telson is a little longer than broad.

Diploexochus longipes B-L.

1909. *Diploexochus longipes*. Budde-Lund in Schultze, Reise, ii, p. 55, pl. 5, figs. 8–11.
 1910. „ „ Stebbing, Gen. Cat. S. Afr. Crust., p. 446.
 1924. „ „ Barnard, Ann. S. Afr. Mus., xx, p. 233.

Surface minutely squamate. Rugae obsolete. Epistome not strongly raised.

Peraeon segment 1 with margin thin, not grooved, hind corner unequally cleft, internal tooth rounded.

Pronotum $\frac{1}{8}$ (original description); $\frac{1}{8}$ – $\frac{1}{7}$ in MSS. conspectus.

Segments 2–7 “duplicatura inferiore epimerorum nulla.”

Telson scarcely broader than long, sides strongly incurved, apical margin nearly straight.

Antenna 2, 2nd and 4th joints subequal, 2nd flagellar joint about twice 1st.

Uropod, peduncle longer than broad, outer ramus minute, inner ramus short, twice as long as broad.

10 × 5 mm. In alcohol, yellowish, hind margin of segments with inconspicuous dark spots.

Locality.—Damaraland: Okahandja (Budde-Lund).

On a cursory examination of the Budde-Lund collection in the British Museum, it seemed to me that this species was very likely synonymous with *quadrимaculatus*.

Diploexochus quadrимaculatus B-L.

(Fig. 72, d, e.)

- | | | |
|-------|---------------------------------------|---|
| 1909. | <i>Diploexochus quadrимaculatus</i> . | Budde-Lund, Schultzes Reise,
ii, p. 54, pl. 5, figs. 1–7. |
| 1910. | „ „ | Stebbing, Gen. Cat. S. Afr.
Crust., p. 446. |
| 1924. | „ „ | Panning, Beitr. Kennt. Land.
Süßwasserf. S.W. Afr., ii,
p. 176. |
| 1924. | „ „ | Barnard, Ann. S. Afr. Mus.,
xx, p. 233. |

Surface minutely squamate. Rugae obsolete. Epistome not strongly raised.

Peraeon segment 1 with margin rather thin, not grooved, hind corner unequally cleft, internal tooth rounded. Internal tooth on segment 2 small.

Pronotum almost $\frac{1}{3}$ (original description); $\frac{1}{8}$ – $\frac{1}{7}$ in MSS. conspectus.

Segments 3–7 with a slight thickening on lower surface of epimera.

Telson slightly broader than long, sides strongly incurved, a minute median impression proximally (not mentioned by Budde-Lund).

Antenna 2, 2nd joint shorter than 4th, 1st flagellar joint slightly longer than 2nd.

Uropod, peduncle longer than broad, buter ramus minute, inner ramus very small, not longer than broad (description), twice as long as broad (figure).

11-12 × 5.5 mm. In alcohol, yellow, a series of 4 dark spots on hind margin of the segments.

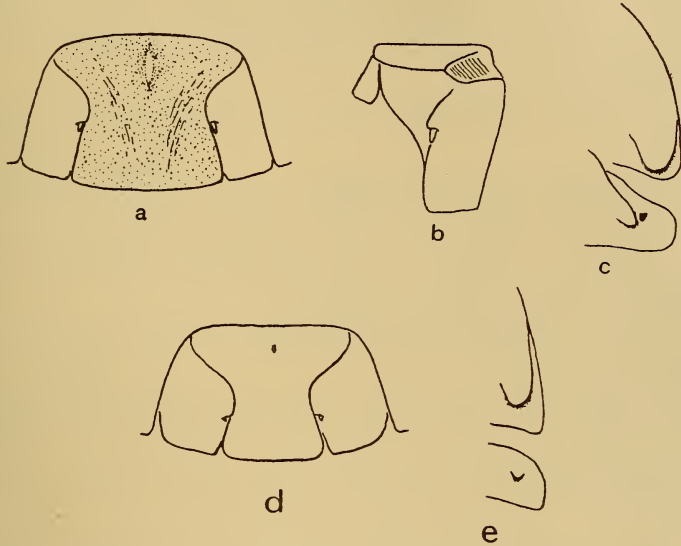


FIG. 72.—*Diploexochus gordoniensis* n. sp. *a*, Telson and uropods; *b*, dorsal view of uropod; *c*, ventral view of epimera 1 and 2. *D. quadrimaculatus* B.-L.: *d*, telson and uropods; *e*, ventral view of epimera 1 and 2. (*d* and *e* from specimen in Budde-Lund collection in British Museum.)

Locality.—Great Namaqualand: Keetmanshoop (Budde-Lund); Kuibis (Panning).

This species, known only from two localities in the southern portion of South West Africa, and *gordoniensis*, which occurs up to the border of South West Africa, are undoubtedly very close. The obviously unequal cleft of peraeon segment 1, however, easily separates them, and the telson is more coarctate here than in *gordoniensis*. Both have the minute bare impression at base of telson.

Budde-Lund in his MSS. conspectus has placed both this species and *longipes* under division 4*b*. "Pronotum breve, tamen $\frac{1}{8}$ - $\frac{1}{7}$ dorsi vix brevius," thus conflicting with his original descriptions of both species. The length of the 1st flagellar joint is unusual.

Diploexochus gordoniensis n. sp.

(Fig. 72, a-c.)

Surface minutely, but distinctly, granulate, especially on posterior portions of peraeon segments. Rugae obsolete. Epistome not strongly raised, dorsally reflexed.

Peraeon segment 1 with margin thick, reflexed, grooved in posterior half, hind corner subequally cleft, internal tooth rounded. Internal tooth on segment 2 oblique, subacute, but not nearly so strongly separated from epimeron as in, e.g., *thomsoni*.

Pronotum $\frac{1}{6}$ – $\frac{1}{5}$.

Segments 5–7 with slight transverse ridge on lower surface of epimera.

Telson a little broader than long, sides incurved, distal portion also wider than long, apical margin slightly convex, dorsally nearly evenly convex, with a very faint median impression at base (not really impressed, but naked, not covered with the minute squamulae occurring over the rest of the surface).

Antenna 2 not very slender, 2nd and 4th joints subequal, 2nd flagellar joint twice 1st.

Uropod, peduncle longer than broad, apex subquadrate, outer ramus minute, inner ramus very short and stout, scarcely twice as long as broad, extending barely more than $\frac{1}{4}$, at most $\frac{1}{3}$, distance to apex of telson.

Up to 10 × 4 mm. Pale dull brownish, hind margins of segments and dorsal parts of pleon darker brown or slaty-greyish, epimera, pleurae, and distal part of telson usually paler, eyes black, antennae and legs pale.

Localities.—Cape Province: Dyason's Klip, Keimoes, Vaalhoek, north bank of Orange River opposite Kakamas, Zwaardraai, Reimvasmak, Noap Hills, Narugas, Aries, Bak River (K. H. B. and S. H. H., 1925).

Great Namaqualand: Nakob (K. H. B., 1925).

In the shape of the telson and the coloration similar to *rufescens*, but distinguished by the internal teeth on segments 1 and 2, the absence of the *oblique* ridges on lower surfaces of epimera, and the wider pronotum. From *quadrifasciatus*, which also has a wide pronotum, it is distinguished by the subequal cleft of segment 1.

All the above localities are situate in Gordonina, on the north side of the Orange River, Nakob being just over the border in South West Africa; the Bak River and Aries are on the border line.

Diploexochus pilula n. sp.

(Fig. 73.)

Strongly convex, surface very smooth. Rugae quite obsolete. Epistome demarcated above from head only by a very obscure line, front convex above, concave below. Eyes small, ocelli 6.

Peraeon segment 1 with margin thick, reflexed, grooved in posterior half, hind corner equally cleft, internal tooth rounded. Internal tooth on segment 2 small, subacute.

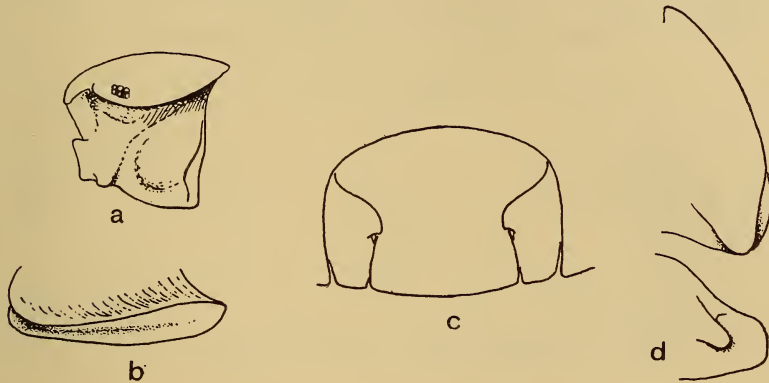


FIG. 73.—*Diploexochus pilula* n. sp. a, Lateral view of head; b, external lateral view of epimeron 1; c, telson and uropods; d, ventral view of epimera 1 and 2.

Pronotum $\frac{1}{2}$.

Telson a little broader than long, sides incurved, apical margin slightly convex, dorsally evenly convex; ventrally with median groove near base.

Antenna 2, 4th joint a little longer than 2nd, 2nd flagellar joint 2–2½ times 1st.

Uropod, peduncle slightly longer than broad, apically narrowed, apex subquadrate, outer ramus minute, inner ramus moderately short, 2½ times as long as broad, extending half-way to apex of telson.

Up to 7 × 2.75 mm. In alcohol, whitish, eyes black.

Locality.—Cape Province: Katberg Forest (J. Hewitt, Albany Mus.).

Resembling *thomsoni* in the feebly demarcated epistome and the thick, reflexed margin of segment 1.

Diploexochus aenigma n. sp.

(Fig. 74.)

Surface minutely granulate. Rugae distinct, but not continuous across dorsum. Epistome not strongly raised.

Peraeon segment 1 with a low triangular boss (obscurely subdivided) in middle of anterior margin. Epimeral margin thick, reflexed, grooved throughout its length, hind corner unequally cleft, internal tooth broad, rounded-truncate, with a small indent. Internal tooth on segment 2 short, transverse, adjacent to anterior margin.

Pronotum broad, one-quarter dorsal length of segment.

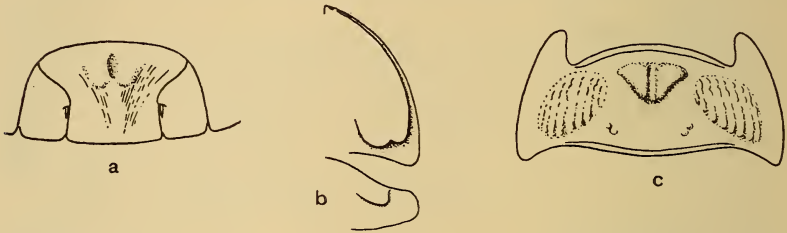


FIG. 74.—*Diploexochus aenigma* n. sp. a, Telson and uropods; b, ventral view of epimera 1 and 2; c, peraeon segment 1.

Segments 3-7 with slight transverse ridge on lower surface of epimera.

Telson broader than long, distal portion subquadrate, sides slightly incurved, apical margin almost straight, dorsally gently tumid at base with a very shallow oval median impression.

Uropod, peduncle about as broad as long, outer ramus short, extending half-way to apex of peduncle, inner ramus long, reaching almost to apex of telson.

9 × 4 mm. Slaty-grey, with a medio-dorsal lighter stripe, pleurae pale.

Locality.—Natal: Stella Bush, Durban (K. H. B., 1912).

This species is close to *burnupi* in external appearance, but distinguished by the dorsal sculpturing and the telson being relatively shorter proportionately to its width.

The width of the pronotum is quite exceptional for a *Diploexochus*, but the species seems to fit into this genus better than into the others.

Diploexochus cingulatus n. sp.

(Fig. 75.)

Strongly convex. Surface minutely granulate. Rugae not strong, but distinct, forming on each segment a transverse slightly raised band continuous across the dorsum. Epistome not strongly raised, slightly reflexed dorsally, biconcave ventrally.

Peraeon segment 1 with 2 slight rounded bosses in middle of anterior margin. Epimeral margin thin, reflexed, slightly costate, hind corner shortly cleft, the outer margin of the internal lamina forming the margin of the epimeron, and visible externally in lateral view. Internal tooth on segment 2 slight, adjacent to anterior margin.

Pronotum on segment 2 slightly less than $\frac{1}{3}$, on posterior segments $\frac{1}{3}$.



FIG. 75.—*Diploexochus cingulatus* n. sp. a, Dorsal view of uropod; b, telson and uropods; c, external lateral view of epimera 1 and 2; d, ventral view of epimera 1 and 2, with marginal view of epimeron 1; e, lateral view of peraeon segment 3, showing articular surface or pronotum (unstippled).

Telson broader than long, distal portion very short, its sides scarcely incurved, apical margin almost straight, dorsally tumid with 2 low rounded tubercles basally, followed by a similar median one.

Antenna 2 short and stout, 2nd and 4th joints subequal, 2nd flagellar joint 3 times 1st.

Uropod, peduncle stout, as broad as long, outer distal corner rounded, inner margin slightly concave, outer ramus minute, near apex, inner ramus long, 3 times as long as broad, extending almost to apex of telson.

6 × 2 mm. Pale greyish.

Locality.—Natal: Stella Bush, Durban (K. H. B., 1912).

This species is remarkable for the breadth of the pronotum (unless it should be assigned to another genus), the interlocking of the 1st and 2nd epimera, and the position of the outer ramus of uropod.

*Species Cubaridarum incertae sedis an inquirendae.**Diploexochus orbicularis* (B-L.).

1885. *Armadillo orbicularis*. Budde-Lund, Crust. Isop. Terr., p. 23.
 1904. „ „ *Id.*, Rev. Crust. Isop. Terr., p. 100.
 1910. *Diploexochus* „ Stebbing, Gen. Cat. S. Afr. Crust.,
 p. 446.

Strongly convex, "sublaevis." Eyes small, ocelli few. Epistome dorsally adpressed and scarcely raised above level of head.

Peraeon segment 1 with margin thick, grooved, hind corner equally cleft.

Telson much shorter than broad, sides slightly incurved, distal portion very short, transversely concave, apical margin straight, reflexed.

Uropod, peduncle a little longer than broad, outer ramus minute, inner ramus short.

7 × 3.2 mm. In alcohol, uniform blackish.

This species was described from a single defective specimen, supposed to have come from the Cape of Good Hope. In 1904 Budde-Lund quotes the reference to Dollfus and apparently accepts Dollfus' identification. In view of the discrepancy as regards the telson, this interpretation cannot be conceded. Budde-Lund was unable to assign the species definitely to any one of his sections.

Diploexochus liliputanus (Dollf.).

1895. *Armadillo liliputanus*. Dollfus, Mem. Soc. Zool. Fr., viii,
 p. 346, fig. 3.
 1904. „ „ Budde-Lund, Rev. Crust. Isop. Terr.,
 p. 114.

Rugae distinct. Peraeon segment 1 with a median bituberculate boss on anterior margin. Epistome not strongly raised.

Peraeon segment 1 grooved for almost its entire length, hind corner nearly equally cleft (Dollfus' figure), internal tooth truncate or emarginate. Internal tooth on segment 2 well developed.

Telson a little wider than long, sides incurved, apical margin nearly straight, dorsally with 2 low rounded tubercles proximally.

Antenna 2, 2nd and 4th joints subequal, 2nd flagellar joint twice 1st.

Uropod, peduncle as wide as long, outer ramus distinct, not quite reaching apex of peduncle, inner ramus extending two-thirds distance to apex of telson.

4 × 1.75 mm. In alcohol, brown-grey, margin paler, uropods red.

Locality.—Transvaal: Pretoria (Dollfus).

Budde-Lund places this species in his section II = *Diploexochus*, but makes no mention of the pronotal width either in his 1904 or his MSS. conspectus. Both this character and the mandible should be checked on the type material. I have seen no specimens which could be identified with this species.

It resembles *aenigma* in the emarginate internal tooth on segment 1, and perhaps the bituberculate boss on segment 1, but there the resemblance ends; the telson of *aenigma* is shorter, with less incurved sides.

Cubaris natalensis Cllege.

1917. *Cubaris natalensis*. Collinge, Ann. Nat. Mus., iii, p. 573, pl. xli, figs. 11–20.

1920. „ „ *Id., ibid.*, iv, pl. xxvii, fig. 4 (figure shows only 6 peraeon segments).

Body smooth. Epistome not strongly raised apparently.

Peraeon segment 1 with margin grooved for its entire length, hind corner unequally cleft. Internal tooth on segment 2 rather small.

Telson broader than long, distal portion about as long as broad, sides straight, apical margin nearly straight, dorsally evenly convex.

Antenna 2, 2nd and 4th joints subequal, 2nd flagellar joint twice 1st.

Uropod, peduncle longer than broad, apex subquadrate, outer ramus extending half-way to apex of peduncle, inner ramus long, nearly reaching apex of peduncle.

7.5 mm. In alcohol, brown with the positions of the lateral rugae paler.

Locality.—Natal: Krantz kop (Collinge).

Mandible and pronotum not described. From the character of the 1st epimeron the species appears to be almost certainly a *Diploexochus*. The nearest form which I have seen is *aenigma*, but apparently the rugae are not distinct (except by the coloration) in *natalensis*. From the description and figure it is not possible to say whether the internal tooth on segment 1 in *natalensis* has the notch characteristic of *aenigma*.

Cubaris truncatus Cllege.

1920. *Cubaris truncatus*. Collinge, Ann. Nat. Mus., iv, p. 480, pl. xxx, figs. 48–56 (the figure of the whole animal shows only 5 peraeon segments).

Surface finely granulose. Rugae apparently not distinct (except by coloration). Epistome not strongly raised.

Peraeon segment 1 with margin grooved for about three-quarters its length (fig. 54), hind corner unequally cleft. Internal tooth on segment 2 well developed, adjacent to anterior margin (fig. 54).

Telson broader than long, distal portion about as broad as long, sides slightly incurved, apical margin straight, dorsally apparently evenly convex or with a slight median keel proximally (fig. 56).

Antenna 2, 2nd and 4th joints subequal, 2nd flagellar joint twice 1st.

Uropod, peduncle slightly longer than wide, apex subquadrate, outer ramus extending two-thirds to apex of peduncle, inner ramus rather short.

12.5 mm. In alcohol, yellowish-brown with darker brown dorsally and laterally, flecked with yellow.

Locality.—Cape Province: Port Alfred (Collinge).

I have seen no specimens. The type was stated to be in the Albany Museum, but does not seem to have been returned thither.

Gen. CUBARIS Brdt.

1833. *Cubaris* (part). Brandt, Conspect. Oniscid.

1904. *Armadillo* (part). Budde-Lund, Rev. Crust. Isop. Terr., pp. 97, 118 (section vi).

1909. *Cubaris*. *Id.*, in Schultze, Reise, ii, p. 54 (subgen. of *Armadillo*).

Head concrete, antennary tubercles not distinct, epistome without median raised shield, lateral marginal line of head continuous with margin of epistome.

Pronotum broad, at least one-fifth dorsal length of segment.

Hind margin of peraeon segment 1 more or less sinuate.

Epimera large and thin, margin of 1st more or less reflexed, sometimes grooved, the internal tooth on both 1st and 2nd small.

Mandible with several (at least 4) penicils. Inner lobe of maxilla 1 with 2 subequal slender plumose setae, outer apex rounded.

Peraeopod 1 with groove on anterior surface of 5th joint.

Uropod with oblong peduncle, and well-developed cylindrical outer ramus.

Genotype: *murinus* Brdt.

Excluding the doubtful species referred to this genus by Budde-Lund (1904, p. 120), the genus is distributed over the East Indies, tropical and subtropical East Africa, and the West Indies. Two

African species : *murinus* and *egens*, are included here on the chance that they may be found to occur within our region in Portuguese East Africa.

Key to the African species.

1. Outer and inner rami of uropod short. Telson strongly coarctate. Internal teeth on segments 1 and 2 distinct.
 - a. Margin of peraeon segment 1 with slight keel which ends in the internal tooth *burnupi*.
 - b. Margin of 1st segment not keeled *murinus*.
2. Outer and inner rami of uropod long. Telson slightly coarctate. Internal tooth on segment 1 very small ; none on segment 2 *egens*.

Cubaris burnupi ClIge.

(Fig. 76.)

1917. *Cubaris burnupi*. Collinge, Ann. Nat. Mus., iii, p. 572, pl. xli, figs. 1-10.
1920. ,, ,, *Id., ibid.*, iv, pl. xxvii, fig. 3.
1920. ,, *akermani*. *Id., ibid.*, iv, p. 481, pl. xxx, figs. 57-66.
1920. ,, *griseus*. *Id., ibid.*, iv, p. 483, pl. xxxi, figs. 77-85.

Surface minutely granulate. Rugae obsolete ; epimera 2-7 each with a faint transverse ridge on dorsal surface. Epistome not strongly raised, sloping above, with slight median impression.

Peraeon segment 1 with margin reflexed, grooved along its entire length, internal tooth rounded-subtruncate. Internal tooth on segment 2 transverse, adjacent to anterior margin, rounded.

Pronotum about $\frac{1}{4}$.

Segments 3-7 with faint transverse ridge on lower surface of epimera.

Telson slightly wider than long, sides incurved, apical margin slightly convex or almost straight, its width equal to length of telson, dorsally smooth, slightly convex basally with an obscure median granule ; ventrally grooved medianly at base.

Antenna 2, 2nd and 4th joints subequal, 2nd flagellar joint $2\frac{1}{2}$ to nearly 3 times 1st.

Uropod, peduncle apically subquadrangular, outer ramus short, extending about $\frac{2}{3}$ to apex of peduncle, inner ramus twice as long as outer ramus, extending half-way to apex of telson.

Up to 25 x 12 mm. Dark slaty-grey, with lighter wavy streaks in the position of the rugae, apical portion of 5th joint of antennae pale, eyes black.

Localities.—Natal: Pietermaritzburg and Hilton Road (Collinge); Pietermaritzburg and Krantzkop (K. H. B.); Richmond (S.A. Mus.); Krantzkloof (S.A. Mus.); Eshowe (Albany Mus.); M'fongosi, Zululand (Collinge; also S.A. Mus.); near Pongola River, Zululand (Natal Mus.).

The identity of *akermani* with *burnupi* seems obvious. The whole figure of *burnupi* given on pl. xxvii, fig. 3, is stated to be $\times 3$, which would make the animal from which it was drawn exactly 23 mm., the same length as given for *akermani*. This is confirmed by the examination of specimens of *burnupi* and *akermani*, labelled in Collinge's handwriting, *ex* Natal Museum.

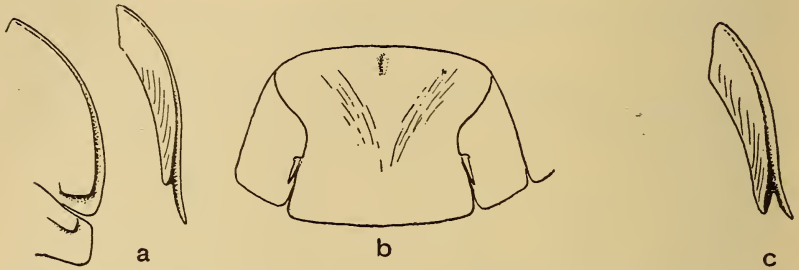


FIG. 76.—*Cubaris burnupi* Clge. *a*, Ventral view of epimera 1 and 2, with marginal view of epimeron 1; *b*, telson and uropods; *c*, marginal view of epimeron 1 of specimen from Pongola River.

In Collinge's fig. 83 of *griseus*, the artist appears to have represented a very well-marked marginal groove on segment 1, but unfortunately the length of the internal tooth in relation to the postero-lateral angle cannot be seen; apparently it resembles *burnupi*. If, on the other hand, the internal tooth is of the same extent as the postero-lateral angle, *i.e.*, if the hind corner of segment 1 is *equally* cleft, the specimens from the Pongola River might be assigned to *griseus*, because they show a very well-marked marginal groove and an equally cleft hind corner on segment 1 (fig. 76, *c*). This, however, is the only difference between these specimens and typical *burnupi*, and it is scarcely sufficient to justify their separation.

In having a wide pronotum and several penicils in the mandible, this species appears to fall into Budde-Lund's Section vi = *Cubaris*, though at first sight it conflicts with his diagnosis as regards the 1st epimeron. In the present species it is distinctly grooved throughout its length. Only when one reads Budde-Lund's descriptions of *miser* and *proximatus* (1904, pp. 121 and 122) and other species in Section vi,

does one realise that *burnupi* resembles *miser*, etc., and does not therefore conflict with Budde-Lund's conception of *Cubaris*. The difference between "per totam longitudinem sulcato" and "per longitudinem carinato" is merely verbal, for where there is a keel ("in dentem . . . desinens") there must be a more or less marked groove alongside it, or vice versa (cf. *Bethalus macrodens*). Unfortunately Budde-Lund gave no illustration of this feature.

Cubaris murinus Brdt.

(Fig. 77.)

1833.	<i>Cubaris murinus</i> .	Brandt, Conspect. Oniscid.
1885.	<i>Armadillo</i> „	Budde-Lund, Crust. Isop. Terr., p. 27.
1889.	„ <i>javanensis</i> .	Dollfus, Notes Leyden Mus., xi, p. 91, pl. v, figs. 1, a-c.
1895.	„ <i>murinus</i> .	Budde-Lund, Ann. Mus. Civ. Genova, xiv, p. 603.
1904.	„ „	<i>Id.</i> , Rev. Crust. Isop. Terr., p. 119, pl. x, figs. 20-22.
1906.	„ „	<i>Id.</i> , Deutsch. Südpol. Exp., ix, p. 88.

Surface minutely granulose. Rugae on head and peraeon distinct. Epistome moderately raised, with slight median impression above, dorso-lateral angles quadrate.

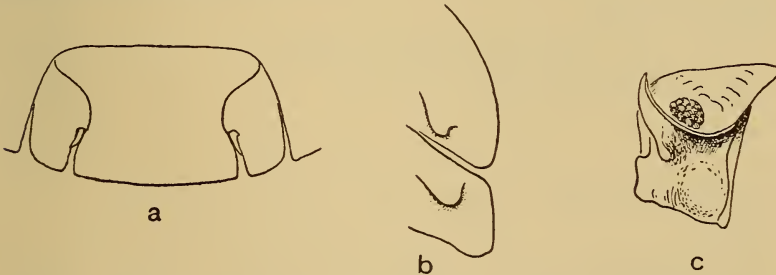


FIG. 77.—*Cubaris murinus* Brdt. a, Telson and uropods; b, ventral view of epimera 1 and 2; c, lateral view of head. (From a Seychelles specimen in the Budde-Lund collection in British Museum.)

Internal teeth on segments 1 and 2 moderately well developed, obtuse.

Telson a little broader than long, apical margin slightly convex, sides strongly incurved, dorsally smooth; ventrally with slight median groove at base only.

Antenna 2, 2nd flagellar joint 2-3 times 1st.

Uropod, peduncle apically subquadrangular, outer ramus short, extending scarcely more than half-way to apex of peduncle, inner ramus short, extending half-way to apex of telson.

Up to 12×6 mm. In alcohol, greyish, uropods pale.

Distribution.—Circumtropical.

This species has not actually been recorded from the region under consideration (lat. 15° S. southwards); the nearest localities are Zanzibar, Seychelles, Madagascar. It occurs on Ascension Island.

The above description and figure are taken from a Seychelles specimen in the Budde-Lund collection in the British Museum.

Cubaris egens (B.-L.).

1904. *Armadillo egens*. Budde-Lund, Rev. Crust. Isop. Terr., p. 124.

Rugae distinct. Epistome not strongly raised, slightly impressed medio-dorsally.

Internal tooth on segment 1 very small, scarcely conspicuous; tooth on segment 2 obsolete.

Telson scarcely broader than long, sides slightly incurved, apical margin straight.

Uropod, peduncle apically broadly rounded, outer ramus long, but not extending to apex of peduncle, inner ramus long, extending almost to apex of telson.

7×3.5 mm. In alcohol, uniformly greyish.

Locality.—Nyassaland (Budde-Lund).

Gen. ANCHICUBARIS Cllege.

1920. *Anchicubaris*. Collinge, Ann. Nat. Mus., iv, p. 484.

1928. ,, Jackson, Proc. Zool. Soc. Lond., p. 592.

Head concrete, antennary tubercles not distinct, epistome without median raised shield, strongly raised above level of head, lateral marginal line of head continuous with margin of epistome.

Pronotum narrow, $\frac{1}{6}$ - $\frac{1}{8}$ of dorsal length of segment.

Hind margin of segment 1 sinuate. Epimeral margin of segment 1 thin, not grooved. Internal teeth on segments 1 and 2 well developed.

Epimera and pleurae more or less spread out horizontally.

Antenna 2 short, 2nd, 3rd, and 4th joints subequal, flagellum 2-jointed. Mandible with several penicils (4-6). Inner lobe of maxilla

1 with 2 subequal rather short plumose setae, outer distal angle rounded-quadrate.

Peraeopod 1 with short groove on anterior surface of 5th joint.

Uropod with oblong peduncle and small cylindrical outer ramus.

Genotype : *fongosiensis* Cllege.

In the narrow pronotum, short antennae with subequal 2nd-4th joints, and mandibles with several penicils, this form agrees with *Pericephalus*, which contains 3 species from Burma. The 2 plumose setae on inner lobe of maxilla 1 are slightly unequal, but not so definitely unequal as in Budde-Lund's figure of *P. marcidus* (1904, pl. x, fig. 17). Not having seen any specimens of *Pericephalus*, I retain the genus *Anchicubaris*.

Jackson's observation that the 1st antennae are present is confirmed.

Anchicubaris fongosiensis Cllege.

(Fig. 78.)

1920. *Anchicubaris fongosiensis*. Collinge, Ann. Nat. Mus., iv, p. 484, pl. xxxii, figs. 86-96.

Strongly convex, with the epistome, pleurae, and telson forming a horizontal flange when the animal is unrolled. Surface minutely squamulose-granulose.

Head with several conical tubercles, 4 in the hinder row. Eyes well developed. Epistome raised considerable above level of head, subquadangular, nearly twice as wide as high, nearly flat.

Peraeon segment 1 with 4 transverse rows of tubercles, 4 tubercles in the front row, 2 in the next, and about 12 in each of the hinder rows. Segments 2-7 distinctly divided into an anterior smooth portion and a raised posterior portion, the latter bearing 2 transverse rows of tubercles, each with about 12 main tubercles, and also some smaller accessory tubercles or granules. The tubercles are more elongate longitudinally than in Collinge's figure. Epimera 2-7 each with a low transverse ridge.

Epimeron of segment 1 large, spread out horizontally, thin, not reflexed, internal tooth rounded ; internal tooth on segment 2 strong, rounded-quadrate.

Pronotum $\frac{1}{3}$ - $\frac{1}{8}$.

Pleon segments 3-5 with a transverse row of respectively 4, 4, and 2 tubercles.

Telson a little wider than long, basal and apical widths subequal,

sides incurved, apical margin nearly straight, dorsally with 2 tubercles near base.

Antenna 2 short and stout, 2nd-4th joints subequal, 2nd flagellar joint $2\frac{1}{2}$ times 1st.

Uropod, peduncle much longer than wide, distal portion with outer and inner margins subparallel, apex rounded-subquadrate, outer

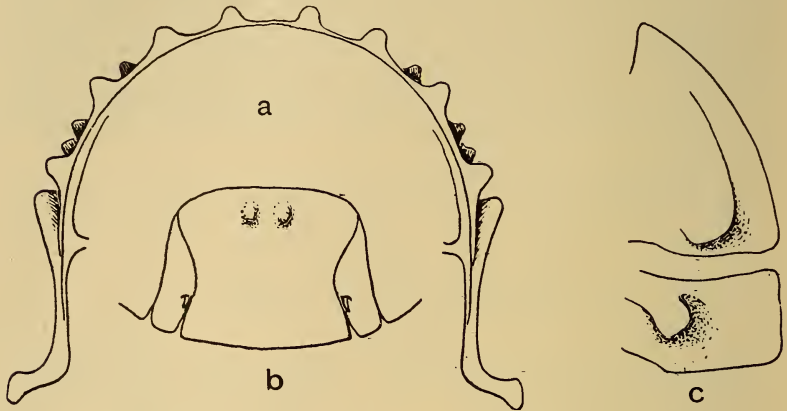


FIG. 78.—*Anchicubaris fongosiensis* Cllge. *a*, Transverse section of segment from middle of peraeon (segment 3 or 4); *b*, telson and uropods; *c*, ventral view of epimera 1 and 2.

ramus short, extending scarcely half-way to apex of peduncle, inner ramus about $\frac{2}{3}$ basal width of peduncle.

Up to 10.5×5 mm. In alcohol, creamy or buff, eyes black; usually covered with particles of earth.

Localities.—Natal: Durban, Winkle Spruit, and M'fongosi, Zululand (Collinge); M'fongosi (S.A. Mus.).

The South African Museum has a large number of specimens, from 3 mm. upwards, collected by Mr. W. E. Jones at M'fongosi. The sculpturing does not vary; young from the brood-pouch measure 2.5 mm. in length.

Gen. ARMADILLIDIUM Brdt.

1833. *Armadillidium*. Brandt, Conspect. Oniscid.
 1885. „ Budde-Lund, Crust. Isop. Terr., p. 49.
 1898. „ Sars, Crust. Norw., ii, p. 188.
 1928. „ Jackson, Proc. Zool. Soc. Lond., p. 592,
 fig. 19 (structure of head).

Head concrete, antennary tubercles forming distinct ridges over the antennal sockets, epistome with a median triangular raised shield.

Peraeon segment 1 with epimeral margin simple or more or less distinctly grooved, hind corner not cleft.

Pronotum well developed.

Telson trapezoidal or subtriangular.

Antenna 2 with 2nd joint broader than, but subequal in length to, 4th, flagellum 2-jointed.

Mandible with several penicils. Maxilla 1, outer lobe with 9-10 spines, some of the inner ones feebly bifid, inner lobe with 2 slender subequal plumose setae, outer apex produced in a short acute point.

Peraeopod 1 with groove on anterior surface of 5th joint.

Uropod, peduncle short, not visible dorsally in the gap between telson and 5th pleon segment, this gap being filled by the broad, spatulate outer ramus, inner ramus well developed, cylindrical.

Pleopods 1 and 2 with pseudotracheae.

Genotype: *vulgare* Latr.

This genus is at once distinguished by the peculiar form of the uropods from all other genera except *Eluma* B-L. and *Pareluma* Omer-Cooper, 1923. The latter two genera have the hind corner of peraeon segment 1 slightly cleft; and *Eluma* is distinguished by having each eye composed of a single ocellus.

Armadillidium vulgare (Latr.).

(Fig. 79.)

- | | | |
|-------|-------------------------------|--|
| 1804. | <i>Armadillo vulgaris.</i> | Latreille, Hist. Nat. Crust., vii,
p. 48. |
| 1885. | <i>Armadillidium vulgare.</i> | Budde-Lund, Crust. Isop. Terr.,
p. 66. |
| 1898. | „ „ | Sars, Crust. Norw., ii, p. 189, pl.
lxxxii. |
| 1906. | „ „ | Webb and Sillem, Brit. Woodlice,
p. 41, fig. 57, and pl. xxiii. |
| 1906. | „ „ | Budde-Lund, Deutsch. Südpol.
Exp., ix, p. 88. |

Surface smooth and nitidulous, but densely covered with minute scale-spines (see Wahrberg, 1922, p. 7, fig.).

Epimeral margin of segment 1 simple. Pronotum $\frac{1}{3}$.

Telson much broader than long, trapezoidal, apex truncate.

Antenna 2, flagellum subequal to 5th peduncular joint, its 1st joint somewhat shorter than 2nd.

Uropod, outer ramus considerably broader than long.

Up to 17×8 mm. Dark slaty-grey, often almost black, uniform or more or less mottled and variegated with yellowish or brownish, eyes black, legs and antennae dark grey.

Locality.—Cape Province : Cape Town (K. H. B.).

Distribution.—Europe and neighbouring regions of Asia and Africa. Occurs also as an importation in Madeira, N. and S. America, Australia, New Zealand, St. Helena.

This species would appear to be a recent importation into this country. Neither Simon, Schultze, nor the German South Pole

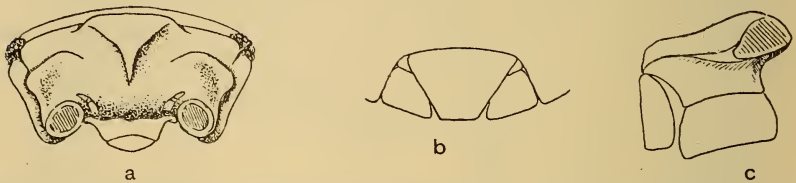


FIG. 79.—*Armadillidium vulgare* (Latr.). *a*, Frontal view of head; *b*, telson and uropods; *c*, dorsal view of uropod.

Expedition collected it. There are no specimens in the South African Museum amongst the material collected by Purcell or Lightfoot. I first noticed it in 1926 in my own garden (in Oranjezicht), where it is now as common as *Porcellio laevis*. It occurs also in the Tamboers Kloof area of Cape Town, but not in the Museum grounds, the Municipal Botanic Gardens, or the National Botanic Gardens at Kirstenbosch.

FAM. EUBELIDAE.

1899. Budde-Lund, Rev. Crust. Isop. Terr., p. 2.

1904. *Id.*, *ibid.*, p. 36.

1907. Richardson, Smithson. Miscell. Coll., vol. 50, p. 220.

1910. Budde-Lund in Sjöstedt, Kilimandjaro-Meru Exp., iii, p. 3.

1912. *Id.*, Ark. Zool., vii, No. 26, pp. 2, 4.

1922. Richardson, Voy. Rothschild Ethiop., i, p. 19.

Head concrete. Flagellum of 2nd antenna 2- or 3-jointed. Inner lobe of maxilla 1 with more than 2 (5–15) plumose setae.

Telson triangular or quadrangular, not or but little exceeding the pleurae of 5th pleon segment.

Uropod with peduncle short and broad, outer ramus small or minute, mostly terminal in position.

The numerous plumose setae on inner lobe of maxilla 1 is a very

distinctive character (fig. 80). Members of this family are found in tropical and subtropical Africa, Madagascar, and one genus is common to West Africa and the West Indies. The nearest recorded locality to South Africa is the Belgian Congo (*Eubelum lubricum*), but it is quite possible that species of this family will be discovered within our

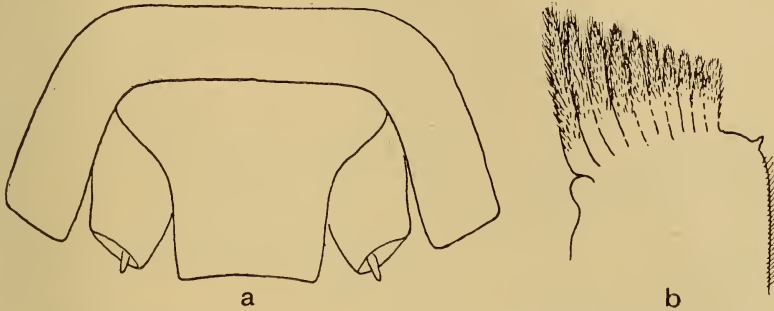


FIG. 80.—*Eubelum lubricum* B-L. Telson and uropods, and apex of inner lobe of maxilla 1 (from Budde-Lund, 1899).

region. It may therefore be useful to include the following synopsis of the genera. *Synarmadilloides*, Nobili, 1926, is not included.

I. Antenna 2, flagellum 3-jointed.

A. Epimeron of segment 1 separated from segment by a groove.

- 1. Margin of segment 1 sulcate, hind corner cleft *Eubelum* B-L.
- 2. Margin of segment 1 not sulcate.
 - a. Hind corner cleft *Mesarmadillo* Dollf.
 - b. Hind corner not cleft (or with only a small internal lamina) *Periscyphops* Hilg.

B. Epimeron of segment 1 concrete with segment.

- 1. Margin of segment 1 sulcate, cleft *Gerutha* B-L.
- 2. Margin of segment 1 not sulcate, but cleft *Benechinus* B-L.

II. Antenna 2, flagellum 2-jointed.

A. Epimeron of segment 1 discrete.

- 1. Segment 1 with hind corner cleft { *Ethelum* B-L.
Ethelumoris Rich.
Ignamba B-L.
- 2. Segment 1 not cleft *Hiallum* B-L.

B. Epimeron of segment 1 concrete. Segment 1 not sulcate, not cleft { *Hiallides* Rich.
Gelsana B-L.

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